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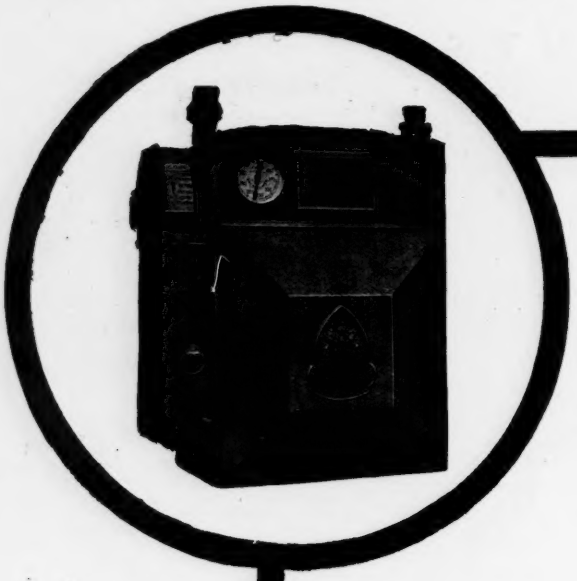

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EDITORIAL NOTES—GAS, &c.

Gas Publicity Conference.

THE necessary arrangements for the gas publicity conference that has been convened by the President of the Institution of Gas Engineers (Mr. Alex. Wilson, of Glasgow), on behalf of the Gas Publicity Committee, have been completed; and it is hoped that the gas industry throughout the United Kingdom will respond by large numbers. The date of the conference is Monday, April 10; the time, 3 o'clock; and the place, the Institution of Mechanical Engineers, Storey's Gate. The date gives good time for arranging engagements to fit in with this one; and the time in the afternoon will enable those who are delegated to represent their undertakings to arrive in time, from quite distant parts, by leaving home the same day. There is no restriction in regard to the position of the office of the delegates to the conference; but, of course, it is expected that they will be members of the administration, or chief executive officials, of undertakings. As we have said before, mere representation at the conference will not bind any undertaking in the matter; so that those Gas Companies or Gas Committees who have not yet signified their adherence to the movement need not have the slightest hesitation on that account to send delegates.

It is especially for such undertakings (the support at the conference of those concerns that have already accorded material support to the project is also desired) that the conference is being held. It is realized that there are several subjects on which doubt exists. Conference and discussion may remove them. More information is required by some as to the lines the movement is to take. The time to obtain this information, and to elicit ideas in regard to the point, will be at the conference. There is the question of the constitution of the General Committee, and the executive and active Sub-Committee. Assurances seem to be wanted in this connection. The Committee now in existence is not the ultimate finished one. It is the preliminary body formed to set the ball rolling, and will be extended to cover the desires of the contributors, and to guarantee the best effective work. There is also the point (upon which we know there is a large amount of doubt in the Provinces) as to the steps that will be taken to ensure the work of publicity being so ordered that there will be some universal benefit arising from it. The conference will be the time to raise and discuss such questions.

This is a conference to be approached in a proper, broad-minded spirit. The movement is not a hole-in-the-corner one; and it is not intended that the work shall benefit one section of the country more than another. It is a common movement—and this cannot be too frequently impressed—in the interests of the entire gas-supply industry, with educational and protective objects at the base. We hope to see that there will be evinced, by the numbers in attendance at the conference, an appreciation of the universal character of the project. The nature and the value of the work rest entirely in the hands of the gas industry. Will the industry rise, with a oneness, to a recognition of its importance? We sincerely hope so.

The Waste of Coke-Oven Gas.

EVENTS move at a fast rate in these days—in connection with bye-product coke-oven plant just as much as in any other direction of the world's activities. With such plants, affairs have travelled much more rapidly in America and Germany than in this country; but we feel sure that this country will in the end reap all advantage that Germany and America have so far realized without having suffered the same amount of loss through the period of development. Admittedly, this is a somewhat selfish view; and the course is one that this country does not often pursue. But it cannot be gainsaid that the bye-product coke-oven owners of this country have benefited largely from the prior experience in this direction from across the North Sea and the Atlantic. Mr. Ernest Bury, we think, will agree with this acknowledgment of the indebtedness in this particular of this country to those named. In the gas industry we know well of Mr. Ernest Bury's enthusiasm in the affairs of the coke-oven industry from the acquaintance formed with him at the meeting of the Institution of Gas Engineers in Dublin in 1907, from his lectures at Leeds University, and through his initiation of the Little Hulton coke-oven gas scheme, which was submitted to Parliament for ratification. This Little Hulton scheme shows Mr. Bury as one of those technical managers of coke-oven plants who want to see the last fraction of economy secured from them; and, of course, such a proper aspiration no one can seriously adversely criticize. But he is not altogether pleased with those who have ventured to criticize the bye-product coke-oven processes in this country. In a paper read before the Cleveland Institution of Engineers but a few days since, he described the criticism that has been passed upon the coke-oven industry as having been unnecessarily harsh. But it does not seem to have been harmed much by it, seeing that, in the short period dating no further back than 1908, the quantity of coal carbonized in bye-product coke-ovens in this country has advanced from 1·8 million tons a year to no less than 8 million tons. This is express progress; and in no direction can progress in economy be stopped.

This 8 million tons of coal is just about half the quantity that is carbonized by the gas industry in this country to-day. The coke-oven manager looks on the large amount of gas that he produces in excess of the requirements of his boilers (and which is therefore wasted), as the one weakness in his bye-product system; and we may be perfectly sure of this, that the coke-oven manager wherever he may be is not going to perpetually allow this leakage in his economy to continue. He has set his mind on piping it, as in Germany and America, for the service of large communities. The villages that are being supplied to-day with coke-oven gas only represent the introduction to the ultimate purpose. It is not a question now of gas-works adopting the bye-product coke-oven system in place of the ordinary gas-retort plant. It is not a question for gas makers whether or not the quantity of good gas produced per ton of coal carbonized in the coke-ovens is equal to the quantity yielded per ton by carbonization in the customary retorts of gas manufacture. The question of the reliability of quality, and that of the constancy of the plant itself, have been fined-down considerably during the past four years. There is little question over these points to-day; and therefore the coke-oven manager comes forward with much more confidence. All he says, and in a commercial spirit, now is: "I am prepared to put into your holders gas "of specified calorific and illuminating powers at so much per "1000 cubic feet; and it is all a question of economy for you "and for me." This was the keynote of Mr. Bury's paper; and, by example, he showed that (under the circumstances of the particular plant, which may or may not be typical) the illuminating and the calorific powers are right, and the analysis of the gas is practically identical with that obtained in horizontal retort working, even to the percentage of inert gas. There is no reason why it should not be with the improved types of bye-product coke-ovens.

But there the matter does not end. And this brings us to the stage where we come to a deadlock, which there has been no attempt as yet to meet by thorough conference or discussion between coke-oven plant managers and gas engineers. If there was certainty of supply, if the coke-oven plant owners were under statutory obligation to supply, if they were not subject to so much disturbance in respect of labour, the way would be much clearer. The gas industry are under statutory obligations; and economy alone cannot be allowed to jeopardize the constant fulfilment of their obligations. Even in the case of the Little Hulton scheme, Mr. Bury

has made provision for the production of gas by ordinary retort plant in the event of a temporary cessation from any cause of the production of coke-oven gas. Imagine a large community (say) like Nottingham or Middlesbrough supplied with coke oven gas, imagine the amount of capital lying idle that would have to be represented in plant and coal storage to meet any temporary stoppage, imagine a sudden cessation of the coke-oven gas supply and the anxiety and time that would have to be expended in firing-up retort-benches and producing a supply of gas in the current mode. We hear Mr. Bury say: "Yet such standing charges and "contingencies would be compensated by the cumulative "economy the coke-oven owner can offer under ordinary "circumstances." "For instance, if Middlesbrough were "supplied with coke-oven gas at 6d. per 1000 cubic feet into "the holder, the town would save approximately £7000 per "annum;" and, further, "there are many centres of coke-"ovens that would be glad to dispose of their gas in bulk to "townships at the price named." There is a glamour about the project. But it is not all so simple and free from difficulties, weighted with heavy responsibilities, as it appears to be to the coke-oven manager from his line of view. There is more in it than evidently meets his eye. But we do not like waste; we do not like to see this excellent gas going begging; we do not like to see it not being put to useful purposes, which are many in all communities. There is full sympathy with Mr. Bury's optimism and self-imposed mission in the interests of economy. But there is the difficulty. Is there no way out of it? America and Germany answer "Yes." But we are conscious of our conditions being somewhat more rigorous than those existing where larger coke-oven gas-supply experience has been obtained. The question of residuals is a subsidiary matter; but some interesting points bearing upon it are found in Mr. Bury's paper.

The History of Development.

ANY attempt to deal adequately with the development of gas making within the compass of a single paper, prepared for reading before a technical organization, must be doomed to certain failure; and this would be distinctly the case where the members of the organization were not all specialists, and the necessity therefore arose for tracing the developments from the inchoate stages of upwards of a century ago. Mr. Samuel Glover experienced this difficulty when writing the paper that he read on Wednesday last before the Liverpool Engineering Society; and, while retaining the title "De-"velopments in Gas-Making," he consequently did wisely in avoiding reference to all the processes of gas making other than carbonization. There, again, he evidently experienced the drastic limitations that the incompatibles, vastness of subject and shortness of time, imposed upon him; for it was but a bird's-eye view that he could give of the pronounced developments from the inception of systematized gas manufacture to the present time—illustrating how process had resulted in working economy, but omitting that immense collateral economy that is represented by the quantity and quality of product now as contrasted with the results in the early days of gas making. Development has yielded dual economy—through lessened operating costs, and through enhanced production per ton of coal, and that has been a highly important aspect of the course of events both for the gas industry and for the times and the people in contributing to the general economy. All engineering has a more or less economic end. But it is not all engineering that can show the same economical ramifications as can gas engineering, which, by the way, Mr. Glover classified as a branch of chemical engineering, and rightly so, though before the term "branch" the word "substantial" might very appropriately have been introduced.

The paper was both historical and descriptive; and the references to Murdoch remind that in the gas industry we do not lay much store on anniversaries, nor do we do much in the way of celebrations. We have passed by several years the centenary of Murdoch's invention in the production of gas and its application to lighting; and we are in the midst of anniversaries of important events associated with gas lighting one hundred years and fifty years ago. Pall Mall was first lighted by gas on Jan. 28, 1807; and, while for a period it was given over to electricity, it returned to its first illuminant in 1910—or 104 years or thereabouts later. An Act of Incorporation was granted to the London and Westminster Gaslight and Coke Company in 1810; and the Charter in April, 1812, from which date for about sixty years the Company were known as the "Chartered." On Dec. 15, 1863, the preliminary meeting of gas men was held, which resulted in the formation of the British Association of Gas Managers. The jubilee of the Institution of Gas Engineers is thus within measurable distance. We are therefore, as remarked, in the midst of anniversaries of events that have been of very considerable importance, and are of historic interest, to the gas industry.

This, however, is a digression into which we have been led by the early historical facts narrated by Mr. Glover, which facts show how, in their conceptions of fundamental requirements in the matter of the setting of retorts for the carbonization of coal, the pioneers and first inventors were so comprehensive that the work which at any time has followed cannot claim the distinction of possessing no trace of direct lineage with the predecessors. All present systems of retort-setting have a place at the very root of the industry's genealogical tree. The developments that have been made have been achieved by the application of scientific knowledge, and the refinements suggested by it and by practical experience. But the economies that have been realized in the process of carbonization have been external as well as internal in relation to the setting; and the external work has been largely in mechanical equipment that, while accelerating the movement and placing of material, and cheapening the cost of the work, has also considerably aided in the reduction of time and heat losses that were inseparable from the preceding hand labour. The names of West, Coze, De Brouwer, and Fiddes-Aldridge are those to whom Mr. Glover very rightly gave the distinction of special mention; and the names that he did not include (in which conjunction his own would have to appear) in connection with the practical development of carbonization in vertical retorts are also to-day as household words in the professional ranks of the industry.

In speaking of the developments with which the names of De Brouwer and Fiddes-Aldridge are identified, the members of the Liverpool Engineering Society must have been struck with the catholic views of gas engineers, as exemplified by their adoption of electricity for driving plant that travels, and that requires its working parts to be raised or lowered and operated. The rejection of an agent that is specially convenient and suitable for work of the kind simply on the ground that it is a competitor would be foolish, and altogether opposed to the principles that should govern the actions of every engineer. But the application of one driving agent under a set of special conditions does not admit the propriety of universal application, as certain short-sighted electrical engineers have suggested. Some analogy is found in gaseous firing for steam-boilers—a subject that was treated upon last week. It does not by any means follow that, because scientific knowledge and practical experience acting in concert have discovered means by which a larger heat efficiency can be procured from gas than from solid fuel in the raising of steam, it will, under all circumstances, be more economical and convenient to use cheap gas in that way than directly in the cylinder of a gas-engine. Electricity is found to be a very useful servant in connection with the newer forms of retort-house plant; but there are few gas engineers who would feel disposed to commit their retort-house operations to the uncertainties of supply from the distribution cables of a central electricity supply station. They find both economy and reliability in their own gas-driven generating sets in the neighbourhood of the place of use.

That is a development in gas-works equipment arising from development; but the next development, in chronological order in the matter of practicability, does away with the superiority of electrical power. That development is the vertical gas-retort, about which Mr. Glover modestly refrained from telling his audience very much. But he did inform those present of two or three particularly favourable points in connection with the system, one at all events of which is peculiar to the continuous method of carbonization devised by Messrs. Glover and West. It is that the construction of the bottom section of each retort is such that the coke leaves the settings in a condition that dispenses with special quenching—the results being that the heat withdrawal from the settings by means of incandescent coke as ordinarily is reduced to (so far as can at present be seen) the practicable minimum, and the coke is in a drier condition for the user than where quenching by water is the fashion. The consumer is the gainer in the weight of combustible material that he purchases. Mr. Glover also points out, among other matters, that the wear and tear of vertical

retorts, and the stresses on the whole structure, are less than in the case of horizontal settings.

It is a big development that can be chronicled in the carbonization field; but Mr. Glover could only present a mere shadow of what it all is, and what it all means. It has taken more than a century to reach the present status in carbonizing efficiency. However, the gas industry and its patrons have found in the economies development has achieved that there is much truth in the ancient aphorism, "Economy is itself a great income."

Gas-Pipes and Road Authorities.

THERE seems to be concerted action abroad by County Councils to place upon gas undertakings more onerous conditions in respect of their use of roads for the accommodation of their mains. The matter was referred to last week in our "Notes from Westminster"—the Staffordshire and Warwickshire County Councils having been striving, before a House of Commons Committee, to impose upon the Tamworth Gas Company some most unreasonable terms. The Committee would not agree to the changes, except in so far as the Company concurred, and in respect of prescribing a 2 ft. 6 in. depth in relation to future, and not existing, pipe work. During the past week, the Middlesex County Council have been to the fore, in the case of the Enfield Gas Bill, with a very similar set of one-sided clauses—clauses proposing to invest them with broad and arbitrary powers of control, and putting upon the Company the whole of any costs incurred, whatever the requirements of the Council might be within the compass of the powers claimed. We are very much afraid that this attempt of the County Councils to shift the whole of the responsibility for whatever may happen, through their operations, to the pipes of a gas undertaking after having been placed in agreed position, and for all alterations that they may desire in the location of pipes and so forth, has been rather encouraged by gas undertakings hitherto giving way bit by bit in order to arrive at agreements with them, to escape opposition. There was, for example, a case not long since where it was agreed to lay future pipes at a depth of no less than 3 feet; and, in another instance, a gas company consented to forego all claims to injury to pipes caused by any steam-roller not above a specified weight. Such compromise has been a mistake. The appetite of the County Councils for shifting responsibility and financial obligation is not satisfied by a small concession. The small concession has, events have proved, only whetted their appetite; and every gain is, as opportunity arises, used as a lever for getting the power applied to other companies in the county concerned, and for securing something additional.

In the Enfield case, Counsel—supported by Mr. C. W. Offord, the General Manager of the Company, and Mr. Arthur Valon—succeeded in defeating the Middlesex County Council's extraordinary claims, other than (and these were agreed to) simple provisions regarding extended time for notices and for presentation of plans. The County Council worked hard to get their clauses accepted; but, in the result, they obtained less than the County Councils secured in the Tamworth Bill. Lord Southwark and his colleagues could not see any necessity for imposing the depth of 2 ft. 6 in.—not even for new pipe work, as allowed by the Commons Committee in the case of Tamworth. As Mr. W. R. Herring points out in an article in another part of the "JOURNAL," there has been no evidence advanced to justify any such depth being prescribed on grounds of safety. As a matter of fact, pipe foundation and not pipe depth is the real factor of safety. Mr. Herring also refers to the many difficulties there are to the fixing of such a minimum depth for pipes. The County Councils should look at the matter from both sides of the hedge, and not merely from their own particular side. In regard to altering the position of pipes in the event of road improvements, the cost of doing this ought not to fall (as the County Councils would have it do) on the gas consumers, but the principle of common justice dictates that it should be taken as part of the expenditure necessitated by the improvement. The Councils should remember that the gas consumers constitute only a section of the ratepayers. The theory underlying public improvements is that all the ratepayers of a district participate in common in any resulting advantage; and therefore no part of the ratepayers, because they happen to be gas consumers, should be expected to be the sole bearers of the expense of any portion of the work involved in the improvement. It is a many-sided matter; and the authorities should regard it in a broad-minded manner, and not seek to force arbitrary and burdensome conditions for the purpose of themselves obtaining relief from present and fairly allocated obligations. Parliament, however, have, by their decisions in the Tamworth and Enfield cases, given gas undertakings encouragement to resist any such proposed infliction of unfair conditions; and it is to be hoped that gas undertakings will offer resistance to attempted imposition, and will not give way on any material point. Such concession is a mistake. The Councils only follow it up by asking for more.

Some Changes and Some Reasons.

THE paper that Mr. W. Upton read before the Southern Junior Association last Friday, on "Some Modern Aspects "of Gas"—a paper that traversed the ground between the Dan and the Beersheba of gas affairs with a rapidity that excites one's admiration—takes our thoughts back to controversy in which several years ago we were deeply engaged. Partly owing to this, it is felt that there are a few statements and impressions in the paper that we should like to correct, principally in the cause of historical accuracy among those at present the juniors in the technical work of the industry. In the first place, Mr. Upton states that the claims that were originally made on behalf of inclined retorts were really due to the adoption of regenerators and machinery, and not to any slight differences in the dimensions of retorts or in the angle of their setting. The statement in itself is incomplete, and a little vague. The angle of the retort was, of course, at the very bottom of all claim; but the introduction of regenerators had really little to do with the advent on practical lines of the inclined retort. Horizontals with regenerators were the approved fashion in new retort or reconstruction work before Coze's invention reached the stage of practicability. As a matter of fact, one of the chief claims for the inclined system was the reduction of machinery that it involved. Heavy power charging and discharging machines had been used prior to that on both sides of the retort-bench; and this meant coal-handling and storage plant on both sides. Where coke-conveyors were employed, the prior arrangements also meant a conveyor on both sides of the bench.

It was against this system—a system that then bid fair to eventually obtain an absolute empire in the region of carbonization for gas production—that the inclined retort came as a rival, and not the system that came as a rival to the inclined retort. The inclined settings made an onslaught on the dual machinery equipment of a retort-bench by only requiring coal elevation and storage and simple charging shoots on one side of the bench, and a coke-conveyor on the other. But the ultimate capital and working expenses did not in all cases work out precisely as engineers imagined they would in comparison with what had preceded; while, in other cases, there was a positive ultimate financial advantage shown. Under the circumstances of the actual order of events, we are not prepared to endorse the view of Mr. Upton that it is probable that had it not been for inclined retorts "the introduction of charging and discharging machines "to horizontals would have remained undeveloped." They had, as a matter of fact, been highly developed at the time that the inclined retort reached the practical stage. Then came the new types of machines—the projector and the pusher and the combined charger-discharger—which put horizontal retort-benches on the same terms as the inclined benches in regard to coal elevation and storage and coke removal on, respectively, one side of the bench only, and did away with at least half the machinery formerly required for charging and discharging horizontal retorts.

In regard to one or two of the other points in the paper, it is to be regretted that this country cannot claim more of the invention of modern times that has had such vital influence on the fortunes of the gas industry. But it must not be forgotten that this country is only one against several; and we cannot expect invention in these times to be concentrated in any single country. If other countries can claim more of the modern gas invention than our own, we can claim a very large share in the developing of it, and bringing about higher perfection and efficiency. Moreover, this country has been responsible for the inventions in continuous vertical retorts, spiral-guided holders, the best efficiency lamps supplied by high-pressure gas, and invention is going forward at good pace in the application of gas—both high and low pressure—to industrial purposes. But it is a good idea to stop and

inquire why it is that the gas industry of this country has not been more prolific in epoch-marking invention. To get a proper answer, we have to examine the character of the inventions from abroad, and the manner of men who have given them to us. The inclined and vertical retort systems were brought to practicable form abroad, carburetted and blue water gas plants originated abroad, likewise purification by liquids in closed vessels, and the incandescent mantle and burner. Carefully examining these and the originators and workers upon them, we cannot avoid allocating them all as the fruits of the higher scientific and technical culture which has obtained and been available in other countries, and which has been directed to the practical ends of industry and daily life. There are other matters in the brightly written paper which we should like to comment upon, but must refrain.

Annual Meeting of the Victorian Gas Association.

In another part of the "JOURNAL" will be found a report of the general business at the fifth annual meeting of the above-named Association, which took place early last November in Melbourne. It may be remembered that at the meeting held in 1909, Mr. Philip C. Holmes Hunt, M.Inst.C.E., the President, was re-elected, as it was considered advisable to retain him in the position in view of his intended visit to this country and the Continent with the object of studying, on behalf of the Melbourne Metropolitan Gas Company, of which he is the Chief Engineer, the latest developments in carbonizing methods. Mr. Hunt's extended tour, which embraced Canada, prevented his return to Melbourne in time to preside at the meeting; and his place was taken by Mr. S. E. Figgis, of Ballarat, ex-President. Two papers were read, and five "Question-Box" subjects discussed. Unfortunately the papers have not reached us in time for their inclusion in our report of the proceedings; and therefore the publication of the technical business has to be deferred. The meeting extended over two days; and in connection with it visits were paid to the Heidelberg Gas-Works and also to the Box Hill works of the Colonial Gas Association. At the latter the members were received by the Hon. George Swinburne, the Managing-Director, and by Mr. E. Tipper, the Works Manager, and were entertained at tea; while on the previous day they were invited to luncheon as the guests of the Metropolitan Gas Company, under the presidency of Mr. Swinburne, who is one of the Directors. The report of the Council of the Association, the accounts accompanying it, and the remarks of the Acting President show that the position of the Association is sound; while the technical portion of the business bears evidence of appreciation of its usefulness. The forthcoming volume of Transactions will no doubt contain some account by Mr. Hunt of his interesting tour, in the course of which he received a cordial welcome from his professional colleagues in Great Britain and on the Continent, whose hospitable welcome and readiness to impart information were acknowledged by him in our columns on the eve of his return to Australia towards the close of November last.

Centrally Hung Lamps in the City.

It looks as though we are nearing a settlement of the lighting question in the City. The Streets Committee of the Corporation are known to be privately busy over the matter; and at the dinner of the Committee the other night, the Chairman (Mr. Josiah Gunton), for the benefit of the visitors present, made a little fissure in the privacy, and so let the guests obtain an indication as to what is being done. For the Streets Committee, the Corporation, and the ratepayers, this is one of the most important pieces of work the Committee have had in hand for many a long day, as, whatever is the outcome of the present settlement, it will mean that the scheme adopted will reign for some years. Mr. Gunton, it may be remembered, was one of the members of the deputation to the Continent in 1909 to inquire into the lighting of the streets and open spaces of the principal cities; and it will be in the recollection of our readers that the deputation came back highly impressed with the efficiency of high-pressure gas lighting, and of the suitability for street purposes of inverted lamps (both high and low pressure), and with a preference for centrally hung lamps. There has been further experimenting in the City; and Cannon Street, at the London Bridge end, has borne witness to the easy applicability of central suspension to the Keith inverted incandescent gas-lamps, while centrally suspended electric lamps of the newest types have been in evidence at the St. Paul's end of Cheapside. For steadiness and evenness of illumination the high-power gas-lamps have shown very decided superiority. It is clear from what Mr. Gunton said at the dinner that the Committee are favourable to central suspension; but he did not say what would be the character of the scheme finally adopted—whether it will consist entirely of one or the other illuminant, or partly of one and partly of the other. But whatever the nature of the scheme, the Committee see their way to doubling the illumination in the streets of the City, and yet save £3000 a year. Before long, however, we may expect the full report of the Committee; and thereafter the scheme will be speedily carried out—inasmuch as Mr. Gunton hopes to continue in the chair another year, in order to witness the completion of the project in which he has taken lively and painstaking interest. In association with this matter, attention may be called to the illustrated account which appears in another column of an important installation of high-pressure gas lighting lately completed in Paris.

More Coal Mines Legislation.

The Government have introduced another Coal Mines Bill, which, if it had preceded the Coal Mines (Eight Hours) Act, would have undermined much of the argument that was advanced in support of the latter measure, and might (it would have been fortunate for everybody if it had done so) have successfully blocked its way to the Statute Book. The strong appeal to sentiment then made by the Government, by pointing to the risks to health and life faced by our underground workers, was largely responsible for the amount of sympathy that the measure obtained. Those who opposed it did so solely on the ground of the reduction of the hours of labour, and the effect upon the price of coal. Among those opponents would have been found a large number who would have given warm-hearted support to legislation that had for its purpose the compulsory provision of all means contributing to the health and safety of coal miners. A Bill for this purpose has now been introduced; and it has received the sympathy of all parties in the House of Commons. It may be found necessary to considerably modify it when coal mine owners and workers have had a chance of fully considering its various provisions. There is sufficient warrant, however, for a measure having the objects of this one in the single statement of the Home Secretary that the death-rate in coal mines (which had been falling steadily year by year for upwards of half-a-century) ceased to drop five or six years ago, and last year there was a very grave rise. The number of persons killed in coal mines in the twelve months was 1620. There can be no question that whatever can be done to prevent this should be done. To deal with the causes of the accidents that make such a heavy demand on life is the purpose of the Bill. Among the provisions it is observed that electricity is to be precluded from any mine where its employment would be attended by risk. Whatever the means taken to assist in the removal of the causes of fatal accidents will, it follows, influence working costs; but men's lives cannot be put in the balance against a trifling extra cost per ton. By the way, it may have escaped the notice of some that the last Home Office statistics show that while the number of men employed in coal mines has ascended from 940,618 in 1907 to 1,049,400 in 1910, the average quantity of coal produced per man descended from 284 tons in 1907 to 264 tons in 1908, 260 tons in 1909, and 251 tons in 1910. In all, some 4 million tons less coal was raised in 1910 than in 1907, though 108,782 more men were employed. The figures are significant.

Municipalities and their Work.

It is customary at the annual meetings of the Association of Municipal Corporations, which are held in the Metropolis, for the Lord Mayor of London to welcome the members. Sometimes this is a more or less formal proceeding; but at last week's meeting, the Lord Mayor (Sir Thomas Vezey Strong) took advantage of the occasion to make some remarks which, in view of his position and the audience to which they were addressed, are fully entitled to the very careful consideration which it is to be earnestly hoped they will receive. While freely acknowledging the advantage of local self-government, he had the courage to admit that even this gain might be purchased at too high a price. Of course, it may. This is the case with most mundane things. The advantages everyone is fairly well acquainted with; but the possible price

is perhaps not so universally taken into account as it might be, and this was the point to which the Lord Mayor mainly confined himself. He said that in his own part of the world, at least, they were approaching the time when the local burdens, superadded to the liability for Imperial expenditure, would amount to such a total sum as to render commercial enterprise with any prospect of a profit extremely difficult, and in many cases impossible; and he put it to them whether they would not all be consulting that greater advantage of the public for which they were working, and which alone justified their existence, by reducing somewhat where possible these gigantic burdens, while at the same time insisting on the maintenance of the highest standard of efficiency. The Lord Mayor's allusion to the results achieved by past efforts in the direction of municipal trading, showed clearly that he has his doubts (as others also have) as to the advisability of pursuing this policy to the lengths that there is at the present time a tendency in many quarters to go.

A Suggestion.

Perhaps at some future date good fruit may be borne by his suggestion that each representative attending the meeting, on returning to his own authority, should move for the appointment of a committee charged with the responsibility of investigating and considering whether, in the case of their own respective authorities, greater economy could not be established. At any rate, it is clear from the subsequent proceedings that members of the Association are fully alive to the burdens which local ratepayers are now being called upon to bear; for the remarks and resolutions were chiefly directed to financial questions, and these matters might have received even fuller attention had it not been that an appreciable part of the time of the meeting was occupied with the discussing of what may be termed the internal affairs of the Association—that is to say, the method of constituting the Council, by whom most of the work of the Association is carried on. In his address, the Chairman (Mr. J. Harmood Banner, M.P.) dwelt upon the need for adequate grants being made by the Government to enable the municipalities to carry out the great works entrusted to them, and to prevent them from being compelled to impose upon the ratepayers a burden calculated to make the name of a municipality to some extent "a bye-word and a reproach." The Association owe a great deal to Mr. Harmood Banner, and the ratepayers will owe him still more if he succeeds in lightening their existing burdens to any appreciable extent. The principle of a municipal income-tax (in place of an assessment fixed on the value of hereditaments and premises) was warmly advocated by the Lord Mayor of Bradford and the Mayor of Halifax; but they failed to carry the meeting with them, in spite of the arguments which they adduced. These arguments, with the remarks of the Lord Mayor of London and the principal portions of the Chairman's address, are in type to appear in our columns, but are unfortunately crowded out this week.

Masonic—Evening Star Lodge.

The installation meeting of this Lodge was held last Wednesday at the Freemasons' Hall, when the outgoing Master (W. Bro. W. A. Surridge) installed his successor in the chair, Bro. Cyril G. Davis. Subsequently the new W.M. invested the following officers of the Lodge for the present year:—

S.W.	W. Bro. C. W. Offord.
J.W.	Bro. W. Edgar.
Treasurer	W. Bro. T. E. Priestman, L.R.
Secretary	,, ,, Walter T. Dunn, L.R.
S.D.	,, ,, E. G. Smithard.
J.D.	,, ,, A. E. Croager.
I.G.	Bro. J. F. Wicks.
Organist	,, J. F. Simmance.
Steward	,, A. P. Main.
,,	,, Fred. West.
,,	W. Bro. H. W. Packham.

The recent death of W. Bro. Sir John Aird having reduced the list of Founders to one, the Standing Committee unanimously recommended, and it was agreed, that the surviving Founder, "W. Bro. Thomas Arthur Greene, P.M., should be elected an Honorary Member of the Lodge in recognition of his services as a Founder, and his long and useful connection with the Lodge since its formation." The Lodge voted forty guineas to the Royal Masonic Benevolent Institution; and W. Bro. Surridge agreed to accept the office of Steward, to represent the Lodge at the forthcoming Festival of the charity.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 945.)

The Stock Exchange has had a bright and pleasant week—especially in its leading markets—quite an improvement on the week before. Such was the prevailing cheerfulness, that troubles in Mexico and China and industrial rioting at home could not impair the calm. Consols steadily advanced; gaining $\frac{7}{8}$ for money and account, and $1\frac{1}{4}$ for special dates. Railways were buoyant and impervious to profit-snatching; and the Foreign Market was unruffled. It was account week, and the settlement was smoothly adjusted. There was a nice tone nearly everywhere on the opening day. Gilt-edged were in demand; Consols rose $\frac{1}{4}$ and $\frac{1}{2}$; and Rails were strong. On Tuesday, fresh business was quieter, but pronounced firmness was maintained. Consols gained another $\frac{1}{8}$; and all the chief departments were strong. Wednesday's business was rather brisker; and the upward movement was again in full swing. Consol quotations rose $\frac{1}{4}$ and $\frac{3}{8}$ and $\frac{1}{2}$ respectively. Railways, too, were full of rise. Thursday brought some realizing; but it did prices no harm. In Consols, another $\frac{1}{8}$ was scored; and markets generally were strong—except Americans. On Friday, the settlement was successfully concluded. Gilt-edged issues were strong and active. Consols were steady, and Rails continued to rise. But Americans were weaker; and, in the Miscellaneous Market, Beer was very flat. On Saturday, markets had a quiet breathing time, without any particular incident or feature beyond a general steadiness. In the Money Market, there was a good demand for short loans until after the settlement; but rates for discount fell away. Cheap money is generally expected in the near future. Business in the Gas Market showed a reduction in point of quantity; transactions being much less numerous than in the week before. But the firmness of the market was as solid as ever; and where there was any change in quotation, it was in the upward direction. In Gaslight and Coke issues, the ordinary was much quieter, and showed no disposition to budge from the old range of prices—$105\frac{1}{2}$ to $106\frac{1}{4}$. The secured issues also were quieter; the maximum being done at $86\frac{1}{2}$ and $86\frac{3}{4}$, and the preference at from $101\frac{1}{4}$ to 102. South Metropolitan was quiet and firm, realizing from $119\frac{5}{8}$ to $120\frac{1}{4}$. The debenture was done at 80. In Commercials, business was marked only in the 4 per cent., which changed hands at from $114\frac{3}{4}$ to $115\frac{5}{8}$. Among the Suburbans and Provincials, Bournemouth "B" was done at $16\frac{3}{16}$, Brighton ordinary at $156\frac{1}{2}$, British at $45\frac{1}{4}$, South Suburban at $119\frac{7}{8}$, Tottenham "A" at $141\frac{1}{2}$, and ditto "B" at $115\frac{1}{2}$ and $116\frac{1}{2}$. On the local Exchange, Liverpool "B" was marked at 163, and ditto debenture at 102—a rise of $1\frac{1}{2}$. The quotations of Alliance, both Brentfords, Chester, North Middlesex, and South Shields advanced. In the Continental companies, Imperial marked from $191\frac{1}{2}$ to $192\frac{1}{2}$, Union from $95\frac{1}{2}$ to $96\frac{1}{4}$, European fully-paid $26\frac{3}{4}$, ditto part-paid from $19\frac{3}{4}$ to $20\frac{1}{8}$, and ditto amalgamated issues *ex rights* from $19\frac{5}{8}$ to 20. Among the undertakings of the remoter world, Cape Town debentures made $88\frac{1}{2}$, Monte Video $12\frac{7}{8}$, Primitiva from $7\frac{13}{16}$ to $7\frac{15}{16}$, ditto preference from $5\frac{1}{4}$ to $5\frac{3}{8}$, San Paulo $16\frac{1}{2}$, and ditto preference $12\frac{1}{4}$.

NOTES FROM WESTMINSTER.

There was a little more animation in the corridors last week; and to this the Gas Bills that were under consideration by Select Committees and by the Unopposed Bills Committee contributed some part, which perhaps can only be defined as small. The Gaslight and Coke Company's Bill and other gas measures had places in a long list of promotions before Mr. Emmott and his colleagues on Thursday; and the Enfield and the Ashborne Gas Bills were disposed of by Select Committees. Whether the two latter will be further opposed in the next House is not yet clear. However, the principal points discussed in connection with them and with the Gaslight Bill are emphasized in the succeeding notes. The Winchester Corporation Electric Supply Purchase Bill is now before the Committee who considered the Enfield gas measure; and the Winchester Gas Company are in opposition—their view being that the proposals of the Corporation are highly speculative, and not in the financial interests of the ratepayers, among whom the Gas Company have an important place. More will be found regarding this Bill in our next issue. The Chesham Gas Bill, on agreement with the Local Authority, is now going forward, but with a purchase clause in it, operative only next session. From the measure the proposed purchase of the undertaking of the Wendover Gas Syndicate has been erased. The Company have also abandoned their stand-by clauses; a small reduction has been made in the capital proposed; and the contemplated standard price has been reduced from 4s. to 3s. 9d.—all under the terms of the agreement. The Warrington Corporation Bill (which was one of the suspended measures from last session, and which contains stand-by clauses) is again on the move—Lord Balfour of Burleigh, the Acting Chairman of Committees in the Lords owing to the illness of Lord Onslow, having given it some consideration last week. All the stages in the Commons were successfully negotiated last session. The Chichester Gas Bill has passed the Unopposed Bills Committee; and so have the Marple, Bicester, and Weston-super-Mare Bills. In regard to the Marple measure, the Home Office tried to put a stake in the stand-by clauses; but the Committee allowed them to stand. Why

the Home Office want to interfere in this matter now that Parliament have granted such clauses in Gas Bills the past two sessions, the same as they have done in the case of Electricity Supply Bills for many years, is not obvious. But Mr. Emmott and his colleagues saw no good reason for disallowing them in this case. It was mentioned during the consideration of the Weston-super-Mare Gas Bill that, by arrangement with the Local Authority, the capital proposed had been reduced from £80,000 to £55,000. Reverting to the illness of the Earl of Onslow, all who have business in the Committee rooms regret his continued absence, and the decision of his Lordship's medical advisers that his strength is unequal to the onerous duties of Chairman of Committees and Deputy Speaker of the House of Lords. It is expected that after the Easter Recess another peer will be invited to accept the position, which has been temporarily undertaken by Lord Balfour.

Special Purposes Fund. The Gaslight and Coke Company's Bill was before the Unopposed Bills Committee last Thursday; and, in regard to the main part of it—the absorption of the Barking and the Chigwell, Loughton, and Woodford Gas Companies—the Committee readily saw that for the districts to be annexed there was immediate financial advantage to be gained from linking them up to that of the Gaslight Company, and prospective advantage to the latter. When cheaper gas is promised, and there is a large obvious, if not express, guarantee of further benefit in this direction for the future, supplemented by the enhancing of the security of the shareholders in the concerns to be annexed, it would be an incomprehensible act for anyone to oppose an amalgamating project. The whole scheme has gone through merrily, with the minimum of trouble. The only point of interest discussed before the Unopposed Bills Committee had reference to the adoption of the special purposes fund clause by the Gaslight Company, to which fund the existing insurance fund is to be transferred. The model clause referring to the special purposes fund provides that the amount to be set aside annually shall not exceed 1 per cent. on the paid-up capital, and the fund is not at any time to exceed one-tenth of the paid-up capital. There is also a proviso that the carry-forward is not to amount to more than the equivalent of a year's dividend. In view of the exceptional magnitude of the capital of the Company, the London County Council had agreed with them that the 1 per cent. and the maximum of one-tenth should be halved, while the carry-forward of undivided profits should, in the circumstances, remain unlimited. The question was discussed by the Committee as to the propriety of allowing freedom in the matter of the carry-forward; but, after the Governor (Mr. Corbet Woodall) had debated the matter thoroughly with the Committee, they satisfied their consciences for allowing freedom as to the amount of the carry-forward by admitting in the circumstances the correctness of the departure (and one departure having been made, there was no harm in another) from the rule of the 1 per cent. and the one-tenth part. If the carry-forward had been limited, it would not have been fair to have curtailed the amount of the appropriation and of the fund by one-half. Mr. Woodall, however, offered the alternative of a two years' limitation. The unlimited carry-forward was preferred by the Committee. In this connection, the question arises, What is paid-up capital? It is acknowledged that it does not include any sum added by conversion, nor premium capital. The Speaker's Counsel (Mr. Ernest Moon, K.C.) says that a lawyer would say that it does not include loan capital—that is to say, something that is owed by a company. Mr. Woodall is of opinion that it should include debentures and debenture stock. It is a moot point. But whatever the lawyers may say, it seems only rational that while borrowed money is represented in the capital expenditure, it should be included in the standing total of paid-up capital for such purposes as that under discussion.

Pipes and Road Authorities. The progressive Enfield Gas Company were before Lord Southwark's Committee last week with their Bill; and they left the presence of their Lordships with the measure intact. The Company really ought not to have been put to the trouble of appearing before the Committee at all; for the only opponents were the Middlesex County Council, and their requirements were not characterized by reason. The fact of the matter was the Council wanted to make the Bill a precedent for putting upon private enterprise in a public service burdens which the Council themselves should bear. Mr. H. T. Wakelam, the County Engineer, made no secret of the object of the Council; for, in one part of his evidence, he boldly said that they wanted to get a certain power in this case, in order that they might obtain it from other gas and water companies in the county. That was a frank admission of a desire to become possessed of means for squeezing the other gas and water companies in the county of Middlesex; and therefore those companies, and for the matter of that gas and water companies elsewhere, ought to feel grateful to the Enfield Gas Company for the stand they made against the proposed oppressive powers. The matters were argued *pro et con* by Counsel, and by Mr. C. W. Offord (General Manager of the Company) and Mr. Arthur Valon (as expert witness for the Company), and the County Engineer. The main argument had reference to the revived pipe requirements of County Councils, in which they have given several turns to the screw. Those, however, whom they seek to squeeze in this regard are showing resentment, and are resisting the plans of the Councils. We saw the success of this resistance in the case of Tamworth last week; we have an instance again of this in the case of Enfield. Parliament is a place where justice as well as legislation can be obtained. If it were not so, private enterprise in gas, water, and electricity supply would soon go under through the efforts and attentions of county and local bodies. The Middlesex Council wanted clauses in the Enfield Bill to give them, among other things, the right to a 2 ft. 6 in. depth for pipes, and authority for making the Company pay for all the alterations to their system that the Council chose to demand when making changes in connection with roads and bridges—in other words, they wished to shift responsibility and expense off their own shoulders on to those of the Company. The general law and existing conditions would not satisfy them. The Company gave way on the extension of the notice as to opening of roads to fourteen days, submission of plans, and responsibility for the proper reinstatement of roads, &c., when openings were made for the purposes of the Company. And the Committee declined, in regard to pipe depth and the expense when changes in the distribution system were required by the Council, to effect any change in the existing condition of things. The Council also wanted to pool the gas supply to all the schools in the district, and get a special rebate on the total bill. The Committee would not concede this. The Company bear their share, through the rates, of the expenditure on public affairs; and there was no good ground for the request for a favoured nation clause in this way. Counsel for the County Council hoped the Committee would decide these matters on their merits. And the Committee did.

A Good Character. It is an excellent thing for a Company to be able to come before Parliament with a good character. A good character has taken the Ashborne Gas Company's Bill safely through the House of Lords. The Company have been well and prudently managed for such a small undertaking. They have an output of only some 24 millions annually; but the low net prices charged to consumers put to shame many a larger concern conducting business on more favourable territory and under more favourable circumstances. Mr. E. H. Stevenson, Mr. John Lister (Chairman of the Company), and Mr. H. G. Harrison (the Manager) had no difficulty in showing Lord Newton's Committee that the conduct of the Company's business had been largely in the interests of the consumers, and well assured their future. Lord Newton is very apt at getting hold of the practical end of things; and he did so on this occasion. Mr. William Cash and Mr. H. E. Jones (appearing for the District Council in opposition) had difficulty in doing more than showing that the Company would not be particularly injured by a reduction of the amount of capital they were now asking for; and they both considered the standard price of 3s. 6d. which the Company were requesting was too high. But beyond these points it was really impossible for them to go—in fact, Mr. Cash candidly confessed that this was one of the best managed non-statutory companies of which he knew. The upshot was that the capital asked for was cut down from £15,000 to £10,000, and the standard price proposed from 3s. 6d. to 3s. 4d.; while a further request of the District Council for a purchase clause was rejected by the Committee. We should be glad to see Parliament exercise discretion more often in the matter of imposing purchase clauses when non-statutory companies are in Parliament for statutory powers for the first time. Local authorities think—the custom has become so hardened—that they have only to ask for a purchase clause, and a non-statutory company may struggle strongly against it, but Parliament will confer it as a matter of course. Why should Parliament grant one in this case? No District Council could do better than the Company have done for the consumers; the chances, in fact, are that they would go and muddle up the good the Company have done. Why, too, when the Company have arrived at a stage when they see the prospect of excellent expansion should they have an abrupt termination put to their existence? We cannot see any reason. Therefore, we are glad that Lord Newton's Committee declined to be parties to pronouncing the sentence of death on a non-statutory Company with a record of good service to their credit.

The Old Tale. Among the Bills before the Unopposed Bills Committee was that of the Bicester District Council, who have succeeded in fixing up an agreement for releasing the local gas-works from that venture of the Preston promoters, the Mid-Oxfordshire Gas Company. In placing the position before the Committee, Mr. E. H. Stevenson mentioned that, until the concern became part of the Mid-Oxfordshire gas undertaking, it was remunerative. It was only because there were such enormous standing charges that they could not pay their way. The old tale in connection with this and similar promotions! The Committee were leniently inclined towards the District Council, and allowed them 35 years in which to repay the loan required to effect the purchase.

Harrogate Reservoir. Lord Kintore and other members of the Upper House have had under consideration the Harrogate Corporation Water Bill. There was opposition from the Knaresborough District and Rural Councils, who want to enjoy benefits, but not contribute to extra expenses involved in obtaining them. The leader of the legal representatives for the Bill was Mr. Balfour Browne, K.C.; and he put the position in a nutshell. The Corporation have a large reservoir known as the Roundhill, authorized by an Act passed in 1901. The present measure is to give the Corporation longer time in which to complete the construction and to confer

on them further powers in respect of domestic rates. The extension of time asked for is rendered necessary by the difficulties experienced in construction. The original estimate for the work was £325,000; but notwithstanding economical management, owing to the difficulties of foundation, and unforeseen circumstances, the reservoir has cost up to date £434,000. Including the accumulation of interest which the Corporation have had to pay, the total costs will amount to £524,000. Without rates in aid and an increase in the water-rate, the Corporation cannot possibly meet this enormous expenditure; and the burden, it is contended, should fairly be shared by Knaresborough. The Committee have agreed to this.

ELECTRICITY SUPPLY MEMORANDA.

Premature Thanksgiving—The Hoary Fiction—Domestic Water Heating—One Hot Bath per Week—Cooking Appliances on Hire or Hire-Purchase—Fire Testimony.

THE electricity supply industry in some quarters is filled with exceeding great joy. The end of the wearisome and dispiriting recessional march of the lighting units is believed to be in sight; and it is hoped the industry will now go forward with sprightly step from the new basis created by the metallic filament lamp, accumulating largely fresh lighting business. This view is not held in all places electrical. For instance, in the Westminster Electricity Supply Company's district, it is said by the officials that only about half the lamps connected to the system have been as yet changed over from the carbon filament type. We cannot bring ourselves to believe that Westminster hangs at the very rear of the progress in changing over; but we do think that much more has to be done in many districts before the electricity undertakings can say of a certainty the clearance is complete of all the effect of the metallic filament lamp. The joy and the optimism expressed appear to be a little premature, and the shareholders and others concerned in electricity undertakings may feel later on that it would have been well to have deferred the thanksgiving and the prognostication to a somewhat later date. The big difficulty of the industry is that new consumers are not attracted quickly enough by the metallic filament lamp; the new connections being largely due to the supplementing of lamp installations already in existence, owing to the consumers' cry for "more light"—light far in excess of the amount specified in electrical literature as sufficient.

It tells its tale that new consumers are not obtained at the rate electricians had anticipated, although it is constantly being dinned into the ears of householders and tradesmen that the metallic filament lamp saves from 50 to 75 per cent. of the cost of current, compared with the old carbon filament lamp. Of course, the quarterly or monthly accounts differ from the statement. The consumer is misled by the manner in which the information is presented to him. There was Mr. J. B. Braithwaite, Chairman of the City of London Electric Lighting Company, saying, at the recent meeting of the shareholders, that a consumer expending £1 in electric current could, by using metal filament lamps, obtain as much light as he would have got for £3 with the old carbon filament lamps. The ordinary consumer reading this might well be pardoned for thinking that, by adopting metallic filament lamps, he would save two-thirds of his bill; but this is not how it works out in practice. Then Mr. Braithwaite goes on to say that this enormously strengthens the position of the electric lighting companies in their competition with gas, and "makes electric lighting, light for light, cheaper than gas, leaving out of account the many advantages which the consumer derives in the way of cleanliness, portability, flexibility, and comfort." This shows that Mr. Braithwaite makes his assertion on the light-for-light basis entirely. If he can be brought to this belief to such an extent that he gives utterance to it at a meeting of the shareholders of the City Company, then we have excellent reason for giving householders, tradesmen, and others a considerable amount of credit for the common sense they display in rejecting the myth. Supposing the average price paid in the City for current for private lighting is 3d. per unit, £1 would purchase 80 units—representing, when using metallic filament lamps, 64,000 candle-hours. Spending £1 on gas in the City at 2s. 7d. per 1000 cubic feet, 7750 cubic feet can be purchased, and, using it with inverted burners giving only 20 candles per cubic foot, would represent to the consumer 155,000 candle-hours, against 64,000 candle-hours. Mr. Braithwaite must have been dreaming, or perhaps he did not correctly understand the information supplied to him, or perhaps he was misinformed. It is impossible to say which is the reason for the misstatement; but we are confident of this, that Mr. Braithwaite was far from the truth in this matter, and this can easily be proved by photometers and test-meters. "Light for light, cheaper than gas!" Will Mr. Braithwaite inform us how he came to make this assertion?

We recently had a few words to say that rather evidenced our inappreciation of some extraordinary calculations that Mr. Percy Good had made regarding the awful drain on Nature's bountiful atmospheric supply that the combustion of gas is responsible for. Mr. Percy Good has refrained from replying to our comments or strictures or whatever is the proper term to apply to them. But we see that Mr. Percy Good is joint author with Mr. A. K. Toulmin Smith of an article, in the "Electrical Review," on "Constant Current Supply." When it was observed that the name of Good was linked up with Smith, it was hoped that it would be found in the joint production that the one had had a steadying influence on the other. There is a little disappointment in this respect, but a large amount of gratification that the scheme proposed in the article is quite harmless to the gas industry, and will be voted by the ordinary householder as altogether impracticable. The electricity industry is convinced that any considerable cheapening of the cost of electrical energy can only take place with an improved load factor; and, therefore, if consumers can be obtained who will take a twenty-four hours' continuous supply, substantial reductions in price can be made to them. In their joint wisdom, Mr. Percy Good and Mr. Toulmin Smith think that a twenty-four hours' load can be secured from the householder if that worthy individual can be induced to kindly supplant his present economical and elastic methods of heating water by a more expensive one, one that limits his provision of hot water, and one that causes his will in respect of hot baths to be subservient to the restricted capacity of the electrical system of heating. The "Therol" apparatus started with the idea that the householder would most willingly depart from his reluctance to help commercial undertakings from which he cannot get value for money expended, in order to benevolently supply electricity concerns with the desideratum of a twenty-four hour load. But the householder has declined.

Messrs. Percy Good and Toulmin Smith, however, are of opinion that a more direct method than the intervention of the "Therol" will meet the case. In a small establishment, they have provided an "ample" supply of hot water for kitchen and bathroom by suitably lagging a tank, and fitting it with resistances. The tank was fitted with three separate heating units, which were well insulated from the water. The pressure of the supply was 210 volts; and the maximum current used by the lamps was about 230 watts. In order to obtain a constant load, the three heating sections were connected to switches, which automatically opened one after the other as the lighting load increased—thus cutting off current from the water and keeping the load at a constant value. It is stated that a constant load of 230 watts has been found to yield an "ample" supply of hot water. We will deal with the "ample" supply directly. The 230 watts constant load it appears to us would represent, at ¾d. per unit as suggested, some £6 5s. 7d. per annum. Perhaps Messrs. Good and Smith have not been sufficiently explicit on the point of cost. But if we have interpreted their contention correctly, we cannot agree that the hot water obtained for the expenditure named would be ample in value or in supply. We may have different notions about the meaning of the word "ample;" and we may have different notions as to the requirement of hot water for ordinary domestic purposes. The arrangement and expenditure described suffice, it is said, for three hot-water baths per week (!) and for the water necessary for other washing purposes—that is to say, three persons can each indulge in one hot-water bath per week, and not one of those persons must encourage any hope of having a second hot bath before another week has expired—unless that person exchanges the order of the bath with one of the others. It depends, too, on the size of the person whether the allowance for each bath is sufficient. We have not the pleasure of the acquaintance of Mr. Percy Good and Mr. Toulmin Smith, so we cannot say anything about their stature or girth; but we should say that neither stature nor girth is great, inasmuch as it is said by these authors and unintentional humorists that in a 5 ft. 6 in. bath of ordinary shape 25 gallons of water is enough for a complete covering of the body. Now, as 25 gallons of water only occupy a space of 4 cubic feet, it is easy to form some notion of the few inches depth of water there would be in a bath 5 ft. 6 in. long and of width enough for the bath of an adult person. It seems, too, that the electrically obtained hot water has to be treated in this diminutive household with the same respect as we hope the beer-barrel is dealt with. We read that, "as the water has been *carefully* used in the present case, the installation has been found to be sufficient to supply all the ordinary requirements of the household of three persons." Mr. Percy Good, even supported by his friend Mr. Toulmin Smith, has not succeeded in convincing us that the proposal is a practicable one for the householder in respect of expenditure and service.

Recently we were referring to the subject of electric cooking, and showing that the electrical engineers in some districts are now very doubtful about the financial advantage to them if electric cooking obtained the vogue that cooking by gas has done—in view of the low charge per unit for any heating purpose, the concurrence of the cooking hours, and the necessity that would arise in their cases for providing distributing cables large enough to take the short-time demand for this purpose. It was pointed out by us that there was little reason to think that electrical engineers need disturb themselves about this; and a correspondent in one of our electrical contemporaries offers confirmation. He takes the wise view that electrical domestic utensils are still too costly for any but the well-to-do; and we may add to this that the modest heating value of electricity is another reason that may weigh materially against the disturbance of the peace of mind of the managers of electricity stations whose distributing systems have a very restricted carrying capacity. Touching the question of the initial cost of appliances, the writer of "Installation Topics" in the "Electrical Times" has lately been praying fervently for some hiring-out scheme to come along. The prayer he has great hope is now in a fair way of being answered. Electricity supply undertakings, he thinks, are unlikely to generally adopt any hiring schemes of their own for some time to come. Which shows prudence on their part. But he believes that an independent company is about to be formed, who will not manufacture apparatus,

but will rely purely upon hire and hire-purchase business for existence. It will be of interest to learn whether or not the writer of "Installation Topics" becomes a substantial shareholder in the new venture. Such a proceeding on his part will disclose greater faith than the mere statement that this sounds a very hopeful proposition, and that future development will be followed with interest—presumably from a distance. The same writer complains that the manufacturers of electrical apparatus construct their cooking appliances in such a manner that it is necessary for the user, on a breakdown, to return it to the makers, for repair, instead of being able to hand it over to the local electrical contractors for remedying the fault. It is certainly a point well worth consideration. Few householders care to expend the money on a single piece of electrical apparatus for cooking purposes; and if that single piece is away a number of weeks in the year, it would be necessary to duplicate it, so that one could be at the makers while the other was at home. What with initial costs, repairing costs, carriage, and current while in use, the householder requires to be wealthy in money and patience who has any leanings in the direction of electrical cooking. This reminds us that one of our electrical contemporaries not long since asked central station engineers for the names and addresses of restaurants, cafés, hotels, and such-like places of refreshment and entertainment that use electricity for culinary purposes. We have been watching for the replies; but, so far, without reward.

Who was the gas manager? If he is a friend of ours and of the gas industry, he will send us a copy of the "Kyl-Fyre" leaflet that he has in his possession. "Meteor," writing in the "Electrical Times," has been complaining bitterly of the leaflet. It was distributed, he states, at a recent demonstration of the efficacy of "Kyl-Fyre," which he describes as a sort of dry powder for extinguishing flames. An electrical engineer and a gas manager are said to have been present at the demonstration; and the demonstrator distributed among his visitors the leaflets, one of which is headed "Electrical Outbreaks." We sincerely trust "Meteor" was telling the truth when he says that the testimonials contained in this leaflet are "all from electrical engineers, in several cases [mark the several] from well-known station engineers in London and the Provinces. One writes to say that he has extinguished a fire 'due to the fusing of cables;' another has used the invention on an 'electrical fire;' a third speaks of cables 'all alight;' and a fourth of electric cable work which had caught fire from a short-circuit." "Meteor's" trouble is that these testimonials, written in the goodness and guilelessness of the hearts of the central station engineers, may be cut out by gas managers for use as domestic powder and shot. We can understand "Meteor's" annoyance, seeing that he knows how these good and guileless central station engineers are, if they are like many of their fellows, constantly telling the public, through the literature that they themselves distribute, that electricity is the safest illuminant, and entirely undeserving of the character of being an insidious agent. But perhaps there is a change for the better in these station engineers; and we may hope to see their goodness and their guilelessness extending to some such statement in their literature as "householders, tradesmen, factory owners, and others who adopt electricity are advised to simultaneously provide themselves with the 'Kyl-Fyre' system of extinguishing flames, for no one, with electricity in the place, knows what the day or the hour may bring forth."

Society of Engineers.—At the meeting next Monday a paper on "The Administrative Aspects of Water Conservancy" will be read by Mr. W. R. Baldwin-Wiseman, Assoc.M.Inst.C.E. In the course of it, he will outline a system of water administration, emphasize the need for grouping river basins, and refer to the tendency of legislation to confer powers on county and county borough councils.

Dr. Lunge on the Manufacture of Sulphuric Acid and Alkali.—We have received from the publishers, Messrs. Gurney and Jackson, of Paternoster Row, E.C., the third volume of Dr. Lunge's work on this subject. It deals with the manufacture of ammonia-soda and with various processes of alkali making and the chlorine industry. The price of the book, of which a more extended notice will appear in a subsequent issue, is 30s. net.

Sinking Funds.—At a meeting of the South Wales and Monmouthshire Society of the Institute of Municipal Treasurers and Accountants, held at Cardiff on the 18th inst., the President (Mr. John Allcock, the City Treasurer and Controller) read a paper on "Sinking Funds and the Accounts in Connection Therewith." He explained at length the various methods by which loans for capital purposes are raised by local authorities, and how in the case of mortgage loans the usual method of repayment is by annual instalments of principal within the period fixed by the Government departments. Where, however, money is raised by stock, this method of repayment is not available. Sinking funds have to be established, and somewhat complicated accounts become necessary. Mr. Allcock detailed the provisions of the Stock Regulations of 1891, 1897, and 1901 bearing on the matter; the methods adopted for calculating the amounts required to be annually carried to the sinking funds were explained; and the proper allocation of contributions between the various funds and accounts of the local authority was indicated. A fully worked-out set of accounts was appended to the paper, to illustrate the various points dealt with.

RETIREMENT OF MR. ONSLOW.

For one still well short of fifty years of age, nearly 32 years' service in the War Office Gas Department, and for a great part of the time in a very responsible position, must be a record. Mr. A. W. Onslow can, on his resignation of the position of Engineer of the Woolwich Arsenal Gas-Works, lay claim to this record. His experience has been, in that capacity, a unique one. Apart from designing new plant and planning reconstruction and extension work, he has been responsible for everything from the making of gas to its utilization both for lighting and heating purposes on the large and the small scale. The experience gained has been extensive and extraordinary. Woolwich has not been the only scene of his activities. He has had charge of the lighting of the various Government works at Pimlico, Weedon, Birmingham, Woolwich Dockyards, Woolwich Garrison, and the Arsenal. It was, however, at Woolwich that his chief work has been centred. As a designer, we remember that he has practically rebuilt the Arsenal Gas-Works—converting among other things the carbonizing plant from direct-fired settings to inclined settings, capable of producing 500 million cubic feet a year. It also comes to mind how, during a strike of gas stokers, the burden fell upon him of ensuring that the Arsenal was not deprived of its supply of gas. A critical time was when, during the South African war, he was suddenly called upon for 100 per cent. more gas. The Arsenal obtained what was wanted, and work there was not delayed a single hour, although the mains were only 10-inch ones. The stress of circumstances at that time will be gathered from the single fact that the temperature of the gas as it passed through the station meters was about 110° Fahr. This pressure of demand and supply went on during nearly the whole war; and in the heaviest time the make of gas was continuous for three months, without ceasing for an hour. This is the sort of thing that has to go on behind the scenes, and does not come on to the open stage of public affairs. Just before he left Woolwich, Mr. Onslow designed new works for the Royal Small Arms Factory at Enfield. In the gas industry, he is best known for his association with high-pressure gas lighting, and the application of high-pressure gas heating to the work at the Arsenal—work small and work exceedingly large, in which constant temperatures and temperatures of (according to the nature of the work) various degrees were required. Mr. Onslow's future arrangements in connection with professional work are not definitely determined. At the present time, he is awaiting the settlement of his reward for past services, and his services have been as valuable as considerable and onerous. In addition to his ordinary duties as gas manufacturing and lighting engineer to the War Department, his patents and inventions, used freely (as they were bound to be, Mr. Onslow being a Government official) on behalf of the public, have saved the country, it is calculated, certainly some £50,000 to £60,000, and that within a recent period.

HANDY TABLES FOR CORRECTING TO NORMAL THE VALUE OF THE HARCOURT STANDARD

WHEN USED IN AIR OF WHICH THE PRESSURE AND HUMIDITY DIFFER FROM NORMAL.*

It has for the time being been agreed by the National Physical Laboratories of Great Britain, France, and the United States that the Harcourt standard pentane lamp shall be accepted as giving a light of exactly ten standard candles when it is burning in an atmosphere containing 0·8 per cent. by volume of water vapour, and at a pressure of 760 mm. It has been also agreed by these laboratories that the standard candle thus represented shall be termed the "International Candle." To this agreement the German physicists have expressed strong dissent; and there will no doubt be a heated discussion thereon at the next International Photometric Congress, which it is rumoured is to be held in Paris in the ensuing summer. No attempt has yet been made to fix a normal temperature for the lamp. Meantime, Mr. C. C. Paterson's formulæ for obtaining the correct value in normal conditions of the light of the lamp when it is used in air containing more or less water vapour than 0·8 per cent., and under a lower or higher barometric pressure than 760 mm., are generally adopted in cases where the correction has to be made. The tables compiled by Messrs. Simmance and Abady, of which we have received a copy, are based on Mr. Paterson's formulæ, and will greatly facilitate their application in making corrections.

The formula for correcting for variations of humidity is

$$\text{Candle power} = 10 + 0{\cdot}066\ (8 - e)$$

where e = litres of water vapour per cubic metre of air. That is, for every 0·1 per cent. of water vapour above 0·8 per cent. the light of the lamp is decreased by 0·66 per cent.; and for every 0·1 per cent. of water vapour below 0·8 per cent. the light of the lamp is increased by 0·66 per cent. Inversely, 1 per cent. difference in light is caused by a variation of 0·151 per cent. in the volume of water vapour in the air. The percentage of water vapour in the air is ascertained ordinarily from the readings of wet and dry bulb ther-

* "Simmance and Abady's Copyright Tables of Corrections for Harcourt's 10-Candle Pentane Lamp." Alexander Wright and Co., Limited, Westminster Palace Gardens, S.W.

mometers and reference to Glaisher's tables. In the still air of a room, the wet bulb thermometer must be exposed to an artificially stimulated current of air. Otherwise it gives the higher reading corresponding to the locally more highly humidified air immediately surrounding it, instead of the reading corresponding to the general air of the room. Ventilating hygrometers—in which a current of air is drawn at uniform rate by a clockwork-driven fan over the thermometer bulbs—have, therefore, been devised, in order to ensure that readings made in the still air of a room shall refer to the general body of that air. The best known of these hygrometers is the extremely costly Assmann apparatus, for use with which special tables are supplied for computing the corresponding pressure of water vapour, from which pressure and the barometric height the percentage of water vapour in the air is readily calculated. The tables which Messrs. Simmance and Abady have so assiduously compiled are intended to save the reference to Glaisher's or Assmann's tables, the calculation of percentage of water vapour from its pressure, and the calculation from Paterson's formula. The tables cover the range of 40° to 72° Fahr. dry bulb reading, advancing by degrees, and differences between the dry and wet bulb readings for every degree from 1° to 15° Fahr.

Mr. Paterson's formula for correcting for variations in the height of the barometer is

$$\text{Candle power} = 10 - 0{\cdot}008\,(760 - b)$$

where b = height of barometer in millimetres. That is to say, a pressure of 10 mm. (= two-fifths inch) above 760 mm. increases the light of the lamp by 0·8 per cent.; while for every 10 mm. that the pressure is below 760 mm. the light of the lamp is reduced by 0·8 per cent. Inversely, 1 per cent. increase in light is caused by an increase of 12½ mm. (= very nearly half an inch) in barometric height, and 1 per cent. decrease in light by a decrease of ½ inch in the barometric height. Messrs. Simmance and Abady give humidity correction tables, as described above, for barometric heights ranging from 28½ to 30½ inches by intervals of ¼ inch. There are, therefore, in all nine tables, each printed in clear type on stout millboard, and hinged within a cover suitable for hanging on the wall for ready reference when the corrections have to be made. The Centigrade degrees and the millimetres corresponding to the Fahrenheit degrees and inches for which the tables have been primarily drawn up are also given, in case the thermometers and barometer used have scales graduated thus.

A memorandum which accompanies the tables explains that when the Harcourt, or indeed any flame, standard of light is used for testing the intensity of a light at a particular time, correction must be made for the variation in value of the flame standard, if the barometric height and atmospheric humidity are other than those adopted as normal for it. This is certainly true in regard to electric lamps and gas-lamps, which are required to afford a particular intensity irrespective of atmospheric changes. A somewhat cryptic paragraph indicates that the compilers of the tables are in some doubt whether they should be applied in statutory testings of the illuminating power of gas, in which the Harcourt lamp is used as the standard. Presumably the light of the flame of the standard gas-burner is liable to vary much as the Harcourt lamp does with fluctuations in barometric height and atmospheric humidity; and the gas-works manager would probably object to these variations being eliminated in the standard lamp (as if an electrical standard of light were used) and not in the gas-testing burner.

However that may be, there is extensive scope for the use of the very handy and well-arranged tables which Messrs. Simmance and Abady have compiled (the calculations are stated to be due to Mr. Abady's individual industry). They will save photometrists a great deal of trouble in calculating corrections for the Harcorut standard lamp.

The Bennis CO_2 Recorder in Gas-Works.

In the course of a paper read at a recent meeting of the Institution of Civil Engineers on "The Heat Losses in an Electric Power Station," reference was made to the above-named recorder. It was advanced that these appliances, with their continuous record, were much superior to periodical tests with a portable apparatus. A high percentage of carbonic acid is desirable when raising steam in coal-fired boilers; and if a recorder assists in obtaining this, it must be an advantage to instal one, provided the amount of coal consumed per annum is sufficient to justify the expense. A continuous record of flue gas analysis is obviously preferable to periodical tests with portable apparatus in a gas-works, where the load varies considerably during the 24 hours. However experienced a fireman may be, he cannot possibly accurately estimate the local conditions. Where the load varies, the required boiler power, of course, varies in proportion—thus the conditions in the boiler-house alter hourly. With a CO_2 recorder installed, the fireman can at any time see how his fires are working; and if his carbonic acid is low, he has a guide enabling him to correct it and keep it correct. It has been pointed out that the main advantages of a reliable CO_2 recorder are four: (1) It shows at any and at all times the percentage of carbonic acid being obtained, so giving a guide to engineers-in-charge and firemen as to the conditions prevailing in the furnaces; (2) it is an index to the correct thickness of fire under different conditions; (3) it is a guide as to the exact amount of draught to be supplied to the fires under varying circumstances; and (4) it is an index of any air leakage between the furnaces and where the gas is taken for analysis.

ROAD AUTHORITIES AND PIPE-WORK.

By W. R. Herring, of Westminster.

The comments in the "Journal" on the decision of Sir Henry Samuel's House of Commons Committee on the Tamworth Gas Company's Bill, and the clauses which the County Councils endeavoured to impose upon the Company, suggest that this subject might be again reviewed.

The fact that the Committee have gone so far as to again establish the practice of fixing the minimum depth for the laying of gas-mains beneath the road surface is, in my opinion, founded upon a fallacy that is yet likely to cause undue expenditure on the part of many gas undertakings. Only those practically engaged in the operation of pipe-laying are in a position to properly appreciate the many difficulties that come in the way of such an obligation. In all except new streets and thoroughfares, it will necessitate the opening of the track in order to ascertain in the first instance the depth at which a commencement of pipe-laying operations can safely be made. Add to this the necessity of laying the main-pipes at an inclination, in order to run off the condensation; and it means that the minimum depth necessitates the average depth being very much greater than the figure prescribed. If there was any real reason for, or advantage to be shown in, laying the pipes at a greater depth beneath the road surface—such, for instance, as their protection from road traffic or from frost—I do not think the gas industry would hesitate to adopt it. In fact, the practice of the past appears conclusively to show that such provisions are unnecessary, as instanced by the very few (infinitesimal in number) breakages that do occur in the highways.

Now it is quite possible that the road authorities are only desirous of protecting what they believe to be the public interest, and to avoid the paying of the few claims that do arise for damage in the way suggested. But if they could only be persuaded to see that any expense that the companies are put to in laying their main-pipes to a greater depth comes directly out of the consumers' pockets in the case of all public undertakings, and to the extent of about five-sixths in the case of sliding-scale companies, I think they are sufficiently enlightened to appreciate the logic of this fact and the illogical provisions which they are forcing upon gas supply authorities.

I do not think it has been suggested that their object is any other than the protection of the pipes from the heavy surface traffic. If this is their only object, it is reasonable to inquire on what basis they have founded their demands. Nine-tenths of the gas-mains in existence are not laid at the depths now prescribed; and yet it cannot be suggested that there is even 1 per cent. of broken mains traceable to heavy traffic. This, in itself, is a sufficient answer to the question submitted. But I had occasion some years ago to carry this point a few stages further. The familiar question was to be decided in a Court of Law; and as it was suggested that the pipes could not stand the pressure of a road-roller without the protecting medium of the roadway above them, I carried out a series of experiments in order to determine the ability of ordinary commercial gas tubing and cast-iron pipes to withstand the pressure that might be brought upon them by road traffic. These experiments were carried out with the aid of the apparatus installed at the Heriot Watt College, Edinburgh; and Professor Stanfield, M.Inst.C.E., collaborated with me.

It is not necessary to relate the whole of the detail (some of which has already been published) on this point, other than say that the pieces of pipe, in turn, were placed between two 6-inch dies, which were pressed together by the mechanism of the testing-machines, and the pressures recorded until distortion occurred or fracture was visible. The following, however, was the conclusion drawn from the experiments so far as they relate to ¾-inch, 1-inch, 1½-inch, and 2-inch diameter service-pipes.

> Assuming that a 1-inch pipe was lying on the road surface and a four-wheeled vehicle, with the flanges or tyres 6 inches wide, and loaded to the extent of 32 tons, could be made to pass over it, the pipe remained sound and without fracture under such conditions.

Similar experiments were carried out upon ordinary cast-iron main-pipes of 3 inches, 4 inches, and 6 inches diameter; and the result of these experiments proved that the ordinary cast-iron pipe is capable of withstanding a crushing pressure of at least 20 cwt. per inch in length of contact surface—assuming the pipe to be bared, and exposed to passing traffic, and unprotected by any road medium. This is rather less than with the service-pipes; but it allows of a waggon with four wheels having only 6-inch tyres, being loaded to the extent of 24 tons to pass over the pipe without injury. These factors make no allowance whatever for the mutual protection afforded by the road crust.

The conclusion drawn from these experiments is:

> That no traffic ever likely to be on a highway is of a sufficiently heavy character to fracture either the main pipe or the service pipes merely as a consequence of its inherent weight.

I carried out some further experiments at the time, by cutting some short lengths of ¾-inch and 1-inch piping, laying them upon the road surface, and causing a 15-ton road-roller to pass over them. The pipes were not fractured. But where the road surface

was uneven, there were one or two slight bends and indentations. The body of the pipe, however, remained sound.

These experiments merely prove that the average experience of the gas engineer is correct, and that the depth at which main-pipes are laid should not be determined on a false issue. It, therefore, suggests an inquiry as to what is the cause of the breakage of pipes, some of which may have stood the test of many years of use and yet fracture on a specific occasion with much less than road-roller traffic.

The explanation is, I think, a simple one. So long as the pipe remains upon the bed upon which it is originally laid, and nothing transpires to disturb the bed, it will keep sound for an indefinite period. But if, in consequence of road disturbance caused by drainage or similar operations in the road, or deep excavations on either side of the road, the foundation of the pipe is disturbed, the result is that, instead of the pipe resting evenly throughout its entire length upon the supporting earth, it is converted more or less into a girder supported at various points; and, as such, it is incompetent to carry even the ordinary traffic of the district without fracture. Given the natural road foundation not disturbed, and a pipe fully bedded throughout its entire length, no traffic that can possibly pass over a road surface can disturb the pipe even at a point 12 inches below the road crust.

I, therefore, maintain that to fix a minimum of 2 ft. 6 in. or 2 ft., which involves the average being considerably greater, is a provision founded upon a fallacious consideration of the cause affecting the stability of the pipes beneath the roadway, and is a waste of public money. So many instances can be given of large and small pipes buried 12 inches or less beneath the road surface in the neighbourhood of docks and railway depôts, level crossings, and similar places, that have stood the test of years without fracture, that it is inconsistent to now say the depth at which a pipe is buried is the factor of safety for its remaining unfractured. On the contrary, it entirely depends upon the foundation on which the pipes are laid; and ordinary earth is sufficient for this support, provided the trench bottom is cut uniformly, and the pipe is bedded for its entire length excepting for the small hole dug out for caulking the socket. On the other hand, if the pipe-trench is level, with a hard bottom, and the pipe is supported on the lip of the socket, fracture is inevitable under these circumstances sooner or later.

If something is not done to further resist the imposition of minimum-depth clauses, we shall soon see clauses inserted in our Bills requiring a bed of concrete to be laid under gas-pipes in the same way that drain-pipes are now required to be supported.

GAS AND ELECTRICITY CLASSES IN ROME.

We learn from a letter which has reached us from the Anglo-Romano Gas Company that, upon the initiative of Comm. C. Ing. Pouchain, the Manager, and as the result of a special agreement entered into between the Company and the Municipality of Rome, there has been opened in the city a school for gas workers and electricians—an establishment which was considered indispensable for the production of capable, well-taught workmen. Indeed, it was regarded as a necessity, in order to complete the courses of instruction in arts and trades now conducted under the auspices of the Municipality. The principal object of these courses is to give men who have already learnt the practical part of their business sufficient theoretical instruction to enable them to execute the work entrusted to them in accordance with the best rules.

There are two complete courses of instruction—preparatory and advanced. They extend from the 25th of October to the end of June; the lessons being given on five evenings a week, and lasting two hours. At the end of the preparatory course an intermediate examination is held; and at the end of the advanced course those who pass receive a professional certificate duly signed by the Municipality. The courses are under the supervision of the Governing Committee of the School of Arts and Trades, acting in conjunction with a delegate of the Anglo-Romano Gas Company. The following are the weekly hours of instruction: Preparatory Course—Arithmetic, geometry, and commercial correspondence, three hours; chemistry and physics, two hours; free-hand technical drawing, three hours; general instruction on materials, one hour. Information on legal matters and first-aid in cases of accidents is given for one hour twice a month. Advanced Course (exclusively for gas workers and electricians)—Applied chemistry, physics, and drawing, one hour each; special lessons on gas and electricity, five hours; practical work, two hours.

Although the announcement of the holding of these courses was made very late, they have been attended by a fairly large number of students. It is considered to be beyond a doubt that in the future, with the results which will be achieved by the institution, many manufacturers and engineers will send their workpeople to it. The effect will be beneficial not only to the working classes, but to their employers, and consequently, in the case of an undertaking engaged in the supply of gas and electricity, such as the Anglo-Romano Company, to the general body of shareholders.

After over fifty years' official connection with the Torquay Gas Company—forty-four years as Secretary and Treasurer and about seven years as a Director—Mr. John Kitson has been compelled by ill-health to resign the position of Chairman, and has been succeeded by Mr. R. P. Kitson.

THE IGNITION POINT OF GASES.

The Annual Meeting of the Chemical Society was held at Burlington House last Thursday—Professor Harold B. Dixon, M.A., F.R.S., the President, occupying the chair.

Professor Dixon, in the course of his Presidential Address, gave an account of his further researches on the ignition point of gases, in continuance of the work on this subject described in his annual address last year, in which the temperature at which ignition occurs is determined by the adiabatic compression of the mixed gases in a tube to the exact extent necessary to bring about explosion; the temperature being calculated from the degree of compression required.

Experiments made with rather larger volumes than previously employed have confirmed the figures first obtained. Photographs of the flames produced in the gas under these conditions, taken on a rapidly moving film by Professor Dixon's well-known method, show that when the ignition is brought about by compression, the combination does not take place simultaneously throughout the mass of the compressed mixture, but that it starts either from a point, the exact position of which varies, or in some cases from a somewhat ill-defined region; and that in all cases a small but appreciable time interval takes place between the starting of the flame and the setting-up of detonation. The duration of this interval varies with different mixtures—least, but still recognizable, with a mixture of two volumes of hydrogen with one volume of oxygen.

The manner in which the explosion is propagated through an explosive mixture when fired by adiabatic compression differs considerably from that observed when the mixture is detonated by a spark; the differences being very clearly shown in the photographic records obtained from explosions carried out by the two methods.

It has also been proved that a slow combination of the gases takes place before the actual ignition point is reached. Thus if the mixture is compressed a number of times in succession to a point just short of that required for ignition, combination of the gases is found to have taken place to an appreciable extent.

A hearty vote of thanks was accorded to Professor Dixon for his services as President during the past two years, and for his present address, which will be published in due course in the Society's "Transactions."

REMOVAL OF SULPHUR COMPOUNDS FROM GAS BY REHEATING.

We have received from Mr. E. L. Hall, the Secretary of an organization working under the title of "The Reheating Process," and having offices at Portland (Ore.), a pamphlet containing particulars of the process named, and setting forth its advantages for the removal of sulphur compounds from gas. The process has been patented in England; and it was described and illustrated in the "Journal" for March 1, 1910 (p. 596).

Briefly stated, the process consists in merely reheating the purified gas to the proper temperature, when the sulphur compounds are broken-down into easily removable sulphuretted hydrogen. The apparatus employed is almost identical with the Lowe double superheater water-gas setting, except that the carburettor is extended to the height of the superheater. Each shell is heated alternately by the generator, which is fitted with up and down steam for the generation of producer gas. Off-take pipes for each superheater dip into a common wash-box. No operating floor is necessary to handle the reheating sets. The position of the apparatus, with the condenser and purifiers, is between the ordinary purifiers and the station meter.

The superheater shells are heated from the generator shell or producer. The purified gas is alternately admitted to the bottom of each reheater, and passes through hot bricks, where the organic sulphur is broken down to hydrogen sulphide. After flowing through the wash-box and condenser, it is purified in oxide of iron purifiers, and then passes to the station meter. The apparatus is kept at about 1200° Fahr. The exhauster works continuously, since one reheater is always put in before the other is taken off. It is stated that the plant is very cleanly, and that there are no nuisances in the way of bye-products. Only one attendant is necessary during the day and one at night. The wash-box has not to be cleaned, since there is no tar or lampblack; and the chequer-work in the reheaters is not subject to wear and tear.

It is claimed that the apparatus will remove, with the utmost certainty, 70 per cent. of the total organic sulphur in the gas. Inasmuch as there is no tar or lampblack produced by heating the gas in this manner—the overflow water being absolutely clear—the hydrocarbons are only slightly affected. As a result, the candle-power losses are insignificant. The life of the material in the secondary purifiers is from five to six times that in the primary ones, due to the small amount of hydrogen sulphide to be removed and the perfect cleanliness of the reheated gas. With regard to the cost of working the apparatus, this will necessarily vary with local conditions; but it is thought that it should not exceed ½d. per 1000 cubic feet, including fuel, labour, repairs, and investment.

THE COLLAPSE OF THE LARGE GASHOLDER AT HAMBURG.

Official Report on the Cause of the Disaster.

(*Continued from page* 836.)

In his report to the Public Prosecutor's Department, Herr Schimming, the Manager of the Berlin Corporation Gas-Works, after discussing other possible causes of the disaster and dismissing them as untenable, concluded, as noticed last week (*ante*, p. 837), that the iron structure by which the roof of the tank was carried was inadequate for the requirements necessarily made of it. This insufficiency could, he said, have been due only to one of three causes—either the material was bad, or the work was unsatisfactory, or the calculation was incorrect.

"In regard to the material, tests were made after the collapse, with satisfactory results; and the strains which it withstood clearly showed that it must, as a whole, have perfectly fulfilled all the requirements. In regard to the work, general inspection, without detailed examination, gave a good impression. For instance, the stay-rods, which are often at fault in iron structures, were well made. Detailed examination, however, disclosed faults in the work. The whole of the holes had been punched, instead of being drilled as required by the contract. Nowhere, however, could a deterioration of the material due to the punching of the rivet-holes be detected. Even the fish-plates, which might have been cracked by the punching, certainly showed no sign of injury, as they were found still sound after the collapse. A rivet was also missing in a diagonal tie; but the eight rivets actually used had proved quite sufficient even to stand the strains brought about by the collapse. Other faulty rivetings had also not suffered in the collapse. There were other small departures from the specification; but, so far as could be seen, they could not have exercised any injurious influence. For instance, a radial girder, which had been broken in unloading, had been reconstructed in a faulty manner. But this girder was found in good condition after the collapse; and it was not one of those which the carpenter witness had reported to be among the first to break. Some of the joints—for instance, those of the middle props to the horizontal strengthening band, the object of which was to preserve the rods against buckling—had been screwed instead of being riveted. These joints had been treated as of secondary importance. It must be admitted, however, that when the *débris* was cleared, these screwed joints were found to be in good condition.

"The only cause of the collapse of the iron structure not already disposed of was, therefore, that important constructional parts had been made of insufficient dimensions. It was evident, from an inspection of the collapsed structure, what had been the weak spot in it. The structure supporting the roof of the tank had consisted of a central prop and radial girders. In the collapse, the radial girders were damaged but little, or in such a way that the damage could either clearly have been caused by the collapse or at least be readily attributable to it. On the other hand, the central props had been destroyed in such a manner that they had evidently been crushed by the load on them. The static calculation of the contracting firms showed that these compression rods had been calculated according to Euler's formula; and a fourfold margin of safety against buckling had been adopted. Euler's formula gives, according to the attachment of the ends of the rods which are subjected to buckling strain, four values. The load which causes a rod to break or buckle is, according to Euler's formula, as follows:—

I. (see fig. 1).

If one end is inserted or embedded and the other is free,

$$P_K = \frac{\pi^2 E J}{4 l^2}$$

II. (see fig. 2).

If both ends are free and are kept in the original axis A-B,

$$P_K = \frac{\pi^2 E J}{l^2}$$

III. (see fig. 3).

If one end is inserted and the other is free, but kept in the original axis A-B,

$$P_K \backsim \frac{2\pi^2 E J}{l^2}$$

IV. (see fig. 4).

If both ends are inserted and are situated in the original axis A-B,

$$P_K = 4\pi^2 \frac{E J}{l^2}$$

[The explanation of these formulæ, which, together with the explanatory diagrams, is taken from the Engineers' Pocket Book known as the Hütte, is as follows:

- l = the length in centimetres of the rod subjected to buckling strain.
- J = the least equatorial moment of inertia of the cross section *a* of the rod in c.m.^{4}
- F = the smallest cross section of the rod in square centimetres.
- k = the permissible crushing strain of the material, in kilogrammes per square centimetre.
- E = the modulus of elasticity of the material, in kilogrammes per square centimetre.

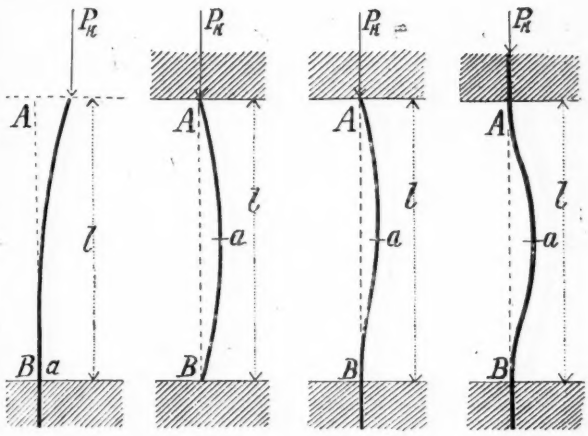


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

P_K = the buckling or breaking load in kilogrammes.

π^2 may be taken as approximately equal to 10.

According to experiments by J. Bauschinger, Euler's formulæ are only applicable when the mean breaking strain, $K_K = P_K : F$ does not exceed the limit of elasticity σ^e.]

"According to the attachment of the ends of the rod, its resistance to buckling varies as $\frac{1}{4} : 1 : 2 : 4$. The responsible constructing engineer of the contracting firms had taken the view that in the case in question the attachment of the ends of the rods was that dealt with in Case III. of Euler's formula, as the formula used by him—viz.,

$$\frac{P l^3}{2 \times 540},$$

corresponds with the formula

$$P_K \backsim \frac{2\pi^2 E J}{l^2}$$

allowing a fourfold margin of safety. The constructing engineer, however, was in error in taking the view that the rods were to be regarded as embedded at one end and as situated at the other end in the original axis. This was a fatal error in the case in question, as it is extremely difficult in continuous built-up rods to secure embedding or gripping of the ends The middle components of a tripartite rod, especially, will be gripped or embedded very little. The horizontal stiffening pieces, moreover, had been made of very slight dimensions. Angle iron 65 by 65 by 7 m.m. (= 2·55 by 2·55 by 0·28 in.) had been used for them, 9 metres (= 29 ft. 6 in). in length; so that they were bowed by their own weight, and therefore could take up no compression forces. In any case, the bracing of the junctions was very elastic.

"In the extreme case with this method of construction, Case II. of Euler's formula would have been applicable—viz., that in which the two free ends were situated in the original axis, disregarding the fact that the cross section was not that of a simple rod, but of a rod built up of two rods.

"Professor Müller, of Breslau, in his report to the contracting firms (dated Feb. 6, 1910), came to the same conclusion. He arrived at the result that the factor of safety against buckling was 1·63. It, therefore, appeared that the mistake of the responsible Constructing Engineer in regard to the effect of the attachments of the ends of the rods, and his assumption that the central props were of equal supporting power, whether their cross section was open or close, resulted in the fourfold factor of safety against buckling, which the Engineer aimed at, being reduced to only 1·63 times. Nevertheless, it would appear that even though the resistance to buckling had not the desired margin of safety, it would still have been sufficient if regard had been paid in the construction to the unavoidable small departures from the specification."

Herr Schimming proceeds to investigate in detail the effect of the cross ties of the compression members in the central column and of the junction plates or fish-plates of the separate supports; and he arrives at the conclusion that the calculation would still have given a sufficiently safe construction if Euler's formula had been rightly applied in respect of the attachment or insertion of the rods which were under compression. The factor of safety, however, might still have been less than fourfold. The assumption made as to the attachment of the ends of the rods introduced an error, however—especially having regard to the fact that the rods were built up and not of a single or uninterrupted cross section. He was also of opinion that it was a mistake to assume that the third points of the angle supports were fixed; and he reiterates that the danger with the members under compression was so much the greater because small constructional errors would result in considerable diminution of the resistance to fracture.

He further took the view that the foreign bodies found in the cups had no effect on the stability of the bottom of the tank, and that they were probably in the cups at the time the holder was tested with air. Observations of pressure when the holder was cupping did not indicate that there had been any jamming due to these foreign bodies. His report then proceeds:

"The foregoing considerations indicate that the structure would have remained standing if it had been possible to carry it out with mathematical precision, as its factor of safety against buckling would then have been nearly 1·63, or, having regard to the increase of the load when the second lift was cupping, it would have been 1·48. The unavoidable errors of working have, in the first instance, caused the collapse owing to the margin of safety being too small. The holder did not similarly collapse when it first had a full load upon it—viz., when it was completely filled with air—for this reason: The trifling unavoidable faults of workmanship must first have asserted themselves when the collapse occurred. The rods in which trifling deviations from the mathematical alignment, which formed the basis of the calculation, were present, must first have given out; and it cannot be said to what extent the slight dimensions of the horizontal bracings of the rods had contributed to the breakdown. As soon as the rods in which the unavoidable discrepancies were greatest had given out, the neighbouring rods were subjected to a greater load, which they could no longer withstand, owing to their insignificant margin of safety. The collapse had, therefore, in consequence of the small margin of safety against buckling originally present in the structure, been imminent, and had been suddenly precipitated when a slightly increased load had been introduced—*i.e.*, when the second lift cupped. The central column then collapsed at once. This column was more completely broken down on one side than on the other; and it was possible that the rods on this side were those which showed greatest deviation from the mathematically prescribed form. It was also possible, however, that the radial girders on the opposite side had been specially firmly and securely attached to the concrete supports. The cause of the somewhat one-sided subsidence of the support cannot be more definitely established.

"The flat roof, being no longer supported in the middle, sank as much as its elasticity allowed, and then split, mainly in two successive longitudinal fissures, and also at right angles to them, producing a very large gap. The position of these fissures and the gap determined the chief direction of outflow, which was on the side towards the carbonizing chambers. In consequence of the confluence of water at the middle and the rapid formation of a very large gap, the following phenomena occurred: Water and gas escaped together from the large gap; the gas being under a pressure of 220 kilos. per square metre (45 lbs. per square foot) rushed out with a velocity of about 50 metres (164 feet) per second, and so penetrated to the floor of the chamber beneath the tank in about 0·36 second. The roof plates crashed down with such force that they severely scraped the inlet and outlet mains, and thereby ignited the gas, as the carpenter witness had reported. As a consequence of the immense gap in the bottom of the tank, there was an immediate rapid descent of the bell. The gas and the air expelled by it rushed out with the force of a hurricane—viz., at a velocity of more than 40 metres (131 feet) per second, producing all the phenomena of a heavy storm. The gas issuing at this high pressure had been fired, as already indicated, and was burning at numerous places. The falling masses of iron could only exert a noticeable action where they happened to encounter moveable objects. The descending bell was one of the falling masses; and it was remarkable that it suffered such little injury—a fact which spoke well for its design and workmanship.

"There would have been negligence if, in the designing of so important a structure as a gasholder, the engineer had allowed less than a fourfold margin of safety in the compression members, taking the customary formulæ for calculating their resistance to buckling. In the case in question, the usual formula—viz., Euler's—had been used, and a fourfold margin of safety had actually been aimed at. But the Constructor's Engineer had fallen into an error in falsely assessing the effect of the attachment of the ends of the rods. It was a question to what extent this error was excusable. That it was permissible to assume rigidity of attachment of the ends of rods in certain circumstances was shown by reference to the procedure of the State Railway Department of Saxony, which, in calculating the crushing strain on rods in panels, sanctioned the free length being taken at three-quarters of the geometrical length of the rods. This corresponded with one end of the rod being embedded and the other free. The *débris* of the collapsed structure demonstrated that this error would not invariably lead to any breakdown. All the members under compression had been calculated according to the same formula, even those of the radial girders. But those of the latter had sustained their load perfectly, and even the strains put upon them in the crash. The reason for this was that the vertical and diagonal rods of the radial girders were simple rods, and not built-up members; whereas the central props were composite rods, which were far more readily crushed or buckled than simple rods which could be better attached or embedded. On the other hand, the compression bands of the radial ties, which were not buckled, were similar built-up members; but they were naturally more firmly held at the separate points of junction than those of the central props. The latter constituted the most awkward part of the structure. One or more such specially awkward or difficult parts occurred in most iron structures, and had to be dealt with particularly carefully.

"It should be observed that, in the instance under consideration, there was no question of the constructing engineer having disregarded the responsibility which his professional obligations placed upon him, for that would entail violation of generally accepted rules of construction. But he could not have violated them, because such generally accepted rules did not exist in this connection. Even in the State and Municipal specifications, a four or five fold margin of safety against buckling according to Euler's formula had hitherto not been required without the existence of special prescriptions as to the method of support or attachment which was to be taken. The latest State instructions of Jan. 31, 1910, were the first to prescribe that the whole length of the system was to be regarded as the length of the constituent members. For the rest, the divergence of views as to the buckling or crushing formula which should be adopted, was shown by the fact that the twentieth edition of the engineers' pocket book, known as the 'Hütte,' gave five such formulæ—viz., those of (1) Euler, (2) Tetmajer, (3) Johnson and Ostenfeld, (4) Schwarz-Rankine, and (5) Bredt—and that the latest Prussian State prescriptions were characterized as quite inapplicable."

This concludes Herr Schimming's report. But before passing on to the observations of the Corporation Lighting Committee, the chief formalæ to which he has referred (in addition to Euler's formula already given) may be quoted from the "Hütte," for the information of readers of the "JOURNAL," who have not that or similar compilations at hand.

Tetmajer having shown that case No. 2 of Euler's formula (*vide ante*) was not applicable, when the ratio (x) of the length (l) of the rod subjected to crushing strain to the arm or radius (i) of inertia was greater than 105 for the grade of iron in question, gives the breaking or buckling strain, at breaking, in kilos. per square centimetre as

$$K_k = K\,(1 - ax + bx^2)$$

in which, for the grade of iron used, K = 3100 to 3210, a = 0·00368 to 0·00361, b = 0, and $x = l : i$.

Johnson and Ostenfeld give the permissible breaking or buckling strain in kilos. per square centimetre as

$$\sigma_k = \sigma\,(1 - cx^2),$$

in which σ = the permissible compressive strain, x = the ratio $l : i$ (*vide supra*), and c = a constant, which Tetmajer has put at 1 : 30,000.

R. Bredt's formula is

$$\sigma_k = \frac{\sigma}{1 + 0{\cdot}00001\,x^3}$$

in which the symbols have the same significance as in the previous formula.

As already stated (*ante*, p. 762), the Public Prosecutor's Department, as a result of the reports made by Professor Krohn and Herr Schimming, stopped the proceedings which it had instituted against an undeclared defendant. It appeared from their considered opinions that it had been certainly proved that the charge of a breach of generally accepted rules of construction could not anyhow be sustained, and that, therefore, the section of the legal code under which the proceedings were instituted was not applicable to the case.

This conclusion was also supported by the opinion given by Dr. Müller, Professor at Breslau, at the instance of the constructing firms. His report stated: "There ought to be no hiding of the fact that the practice of most engineers of applying Euler's formula exclusively, while proceeding to regard two rods joined one to the other by detached cross plates as a single rod—though it is a method of calculating not prohibited at the time in official prescriptions—may lead to structures being erected lacking a proper margin of safety and presenting no adequate guarantee that they will not be overtaxed in cases of exceptional load or strain.

"Also proceedings could not be taken under the sections of the legal code respecting the endangering of life or limb through disregard of professional obligations. The endangering act contemplated therein could only occur if the perpetrator, by giving reasonable attention and foresight, might have anticipated that injury to life or limb would ensue as a consequence (which experience would teach was likely) of his improper action. But the expert opinions showed that the engineer responsible for the construction, having used the generally adopted formula, could in no case have foreseen that the collapse of the gasholder would be a possible consequence of his procedure. Hence, he could not be charged with having imperilled life and limb thereby.

"Mention must be made also of the expert retained by the Public Prosecutor's Department—viz., Mr. E. Körting, General Manager at Berlin of the Imperial Continental Gas Association, who, dealing with the matter chiefly from the standpoint of a gas engineer, likewise expressed the opinion that an explosion could not be regarded as the initial cause of the collapse."

The report of the Corporation Lighting Committee concludes with a statement regarding the victims of the catastrophe. It announces that these numbered 70, of whom 13 were killed on the spot, and 16 were severely injured. Of the latter, seven died. The victims comprised 22 men belonging to the gas-works' ordinary staff, of whom nine, including a foreman, lost their lives; three men (two died) of the works' constructional staff; three workmen in the employ of the Stettin Fire-brick Works; 10 (two died) employees of the Berlin-Anhalt Engineering Company;

24 men (one died) employed by the building firm of Weirich and Reinken, of Kiel; three fitters and two glaziers (both died) in the employ of the firm of Nafzger and Rau, of Hamburg, and four women (all killed) engaged in the canteen inside the vault of the tank. The Lighting Committee arranged for, and bore the expense of, interment at a local cemetery of 16 of the 20 who lost their lives, and erected a suitable memorial to them. The remaining four were interred at a distance by their relatives. Eleven widows and 30 orphans were left, and were provisionally cared for by the gas undertaking until permanent arrangements had been made for their maintenance. A relief fund was started, and 53885·7 marks (about £2640) were subscribed by the general public, of which about one-ninth was applied immediately, and the rest placed at interest for the payment of annuities over a period of six to seven years. The industrial insurance organizations concerned afterwards provided the compensation to the injured and the dependants of the deceased which is enacted in Germany—the gas and water works organization ("Berufsgenossenschaft") having thus to provide for one injured man and the dependants of nine who lost their lives.

GAS AND THE SIMPLE LIFE.

No doubt during last week many people wandered into Caxton Hall, Westminster, for the purpose of finding out, if they could, just what the "simple life" consists of; for there was then being held there the Second Annual Simple Life Conference and Exhibition. Those who went found that the simple life is apparently largely a matter of food. Hence good cooking is an important point; and this is one of the reasons that should make simple livers turn to gas. This being the natural line of thought on strolling through the exhibition, one was not surprised to come across a tastefully arranged stand occupied by the Gaslight and Coke Company, on which was a small Sugg "Westminster" gas-cooker fitted neatly in a recess, to show how such an appliance can be employed under perfect conditions of ventilation. In the recess a little above the cooker hot-plate, a plate-rack was fitted. Gas heating was illustrated by a fitted Fletcher "Palermo" fire in green enamel, with tiles at back and a handsome overmantel by the same firm. The idea, of course, in both instances was to draw attention to the hygienic advantages of properly arranged gas cooking and heating appliances. There was also a Richmond radiator, provided with a ventilating arrangement at the back; as well as their "Edinburgh" nickel-plated griller, and white enamel boiling-rings with trays. Other patterns of fires on view, but not fitted, were Wright's "Stadium" and Richmond's "Bavarian" and "Arabian." Water heating by gas was represented by a Wilson No. 1 circulator. The main lighting of the stand was carried out by means of two Podmore three-burner inverted high-power low-pressure lamps, fitted with the Telephos distance lighter. There were in addition two beautiful standard lamps and a table lamp in Adam design, all of Messenger's make, and having elegant silk beaded shades. Some pretty wall brackets by Sugg and Co. and Hodge and Co. completed what can fairly be described as one of the attractions of the exhibition.

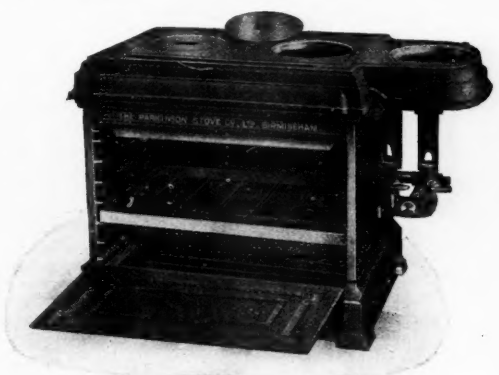
Messrs. James Milne and Son, Limited, have secured from the Metropolitan Water Board the contract for brass fittings. The contract is a substantial one; and the firm are to be congratulated on their success.

Proposed Visit of the London and Southern Junior Association to Exeter.—At the meeting of the London and Southern District Junior Gas Association on Friday, the President (Mr. L. F. Tooth) referred to the visit to Messrs. Willey and Co.'s works at Exeter, which forms an item on the session's programme. The date originally fixed for this was May 11; but a fresh fixture will be made, so as to avoid so nearly clashing with the joint Junior Association's meeting in Birmingham. The exact day has not yet been decided upon; but the London and South Western Railway Company have been approached; and they have promised to provide a special train from Waterloo to Exeter and back, if 100 passengers, at a fare of 10s. each, are guaranteed. The visit will certainly be an interesting one; and therefore the President has good grounds for anticipating that there will be a large turn-out of members.

Structure of Boghead Coal.—The new interpretation, preferred by Professor E. C. Jeffery, of the structure of certain coals, notably of bogheads, is elaborated, with evidence derived from microscopic sections, in the Proceedings of the American Academy of Arts and Sciences. The subject is dealt with in a note in "Nature." On the authority of two famous French palæontologists—Professor Bertrand and M. Renault—the explanation has been accepted that boghead coals are largely composed of colonies of gelatinous algæ, to which the name *Pila bibractensis* has been assigned. This explanation is disputed by Professor Jeffery, who asserts that the thinner microscopic sections prepared by improved methods reveal the presence not of algæ, but of spores of vascular cryptogams. It is significant that the spore structure is more pronounced in American and Scotch boghead coals than in the bituminous schists originally investigated by MM. Bertrand and Renault. Professor Jeffery's interpretation has a wider bearing, inasmuch as it undermines the algal hypothesis of the origin of petroleum.

THE PARKINSON OVEN-GRILLER.

A useful addition to the list of gas cooking-appliances has just been made by the Parkinson Stove Company, Limited, who are placing on the market an oven-griller—intended for the use of small families who have small kitchens. With the ordinary griller, of course, there is available only the top heat, which is absolutely useless for baking and roasting; whereas here, in addition to an excellent griller, there is an oven in which can be cooked a 3½ lb. or 4 lb. joint, and a batter pudding, while at the side a boiling-burner also is provided. The small amount of space needed for the apparatus will be understood when it is remarked that the over-all width is only 20 inches, the depth about 12 inches, and the height 13 inches. In order, however, to make it easily get-at-able, a stand is supplied (separately) which brings the top of the hot plate to a height of about 3 feet from the ground.



Parkinson's Oven-Griller.

The whole of the top is hinged; but when it is raised the loose lids do not fall out, as they are securely held in position. The grilling-burner is in two portions, separately controlled; one tap being placed on each side of the apparatus. There are also the boiling-ring burner on one side, and the oven burner tap on the other. All the burners are removable. A browning shelf is provided; and this, when roasting is in progress, is placed at the top of the oven, just under the grill; the waste heat rendering the hot-plate useful for warming plates or water for washing up. The side boiling-burner is available for use at the same time, if required. When grilling is to be the order of the day, the browning shelf is taken out, and the grid with the grill-pan on it can be placed as near to, or as far from, the burner as may be desired. While grilling is going on, too, the loose lids may be removed, so as to enable boiling to be done in kettles or saucepans at the same time.

That the apparatus is well finished, the name of the makers is sufficient guarantee; and it certainly serves a good purpose, as being something between a cooker and an ordinary griller. Its possibilities and usefulness have been at once recognized—as is evident from the fact that, though it has only been on the market a few days, a large demand is already being made for samples, which, it may be remarked, shows how anxious gas supplying authorities are to avail themselves of anything that manufacturers may from time to time introduce which is likely to prove of use to their consumers.

A "JOURNAL" representative has seen the oven-griller at the Company's show-rooms at No. 129, High Holborn, W.C., and was impressed with its neat appearance and its eminent fitness to meet the circumstances for which it has been designed.

The "Electrician" Electrical Trades Directory and Handbook.—We have received from the "Electrician" Printing and Publishing Company, Limited, of Salisbury Court, Fleet Street, E.C., their Trades Directory for the present year. It is the 29th edition of what is known throughout the electrical industry as the "Big Blue Book;" and while an endeavour has been made to keep the chief features of the publication thoroughly up to date, several new ones have been introduced with the object of making the volume more useful than ever to those who have to consult it as a work of reference. The book consists of three main divisions—Handbook, Directorial, and Biographical; and each has been carefully revised up to the end of last month. The contents are so varied that the publishers have found it necessary to issue a small pamphlet in order to give an adequate indication of their nature. There are upwards of 2000 pages in the book; the number having been increased this year by more than 100. A very valuable adjunct is the group of eight specially prepared tables, bound together, and conveniently arranged for reference and ready comparison. They furnish exhaustive particulars of the electricity supply works and of the electric railway and tramway undertakings of the United Kingdom, British Colonies, Central and South America, Japan, &c., and their electrical and engineering equipments. The price of the work is 15s. net, postage extra.

HIGH-PRESSURE GAS-LIGHTING IN PARIS.

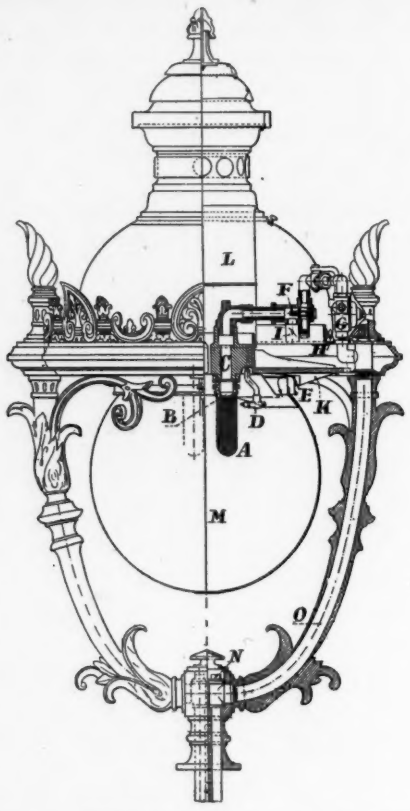
Important Installation in the Boulevard Raspail.

THE number of the "Génie Civil" for the 18th inst. opens with an exceedingly interesting article on "High-Pressure Incandescent Gas Lighting" by M. André Grebel. He deals with the subject with his accustomed thoroughness, and at the close of his communication gives some particulars of an important installation of high-pressure incandescent gas lighting which has been completed on the Boulevard Raspail, in the Luxembourg quarter of Paris. As this is the first installation of high-pressure gas lighting on a large scale in France, the following particulars, which were furnished to M. Grebel by the Paris Gas Company, will be of interest.

High-Pressure Gas Installation on the Boulevard Raspail, Paris.

It appears that preliminary trials were carried out by the Company last year; and from the month of June onwards there were to be seen on the Place de l'Opéra and at the entrance to the adjacent Rue du Quatre Septembre—the scene of the former Gas Company's display of high-power lighting in the early days of the competition of electricity—seven lamps of 1000 Hefner units (say 900 candles), one lamp of 1800 candles, and six lamps of 3600 candles, all on the Graetzin system. There are other installations of high-pressure gas lighting in Paris. On the central refuge in the Place de la Concorde there are twelve Pharos lamps of 1350 and two of 2200 candle power; while six Keith gas-lamps of 1350 and 3600 candle power are installed at the Company's central offices and showrooms in the Rue Condorcet. These three installations, which preceded the one on the Boulevard Raspail, are served provisionally by small compressors worked by electric or compressed air motors located in places which are not altogether suitable for them. They are furnished with flash-jets, and are lighted and extinguished automatically.

The compressing station for the lamps on the Boulevard Raspail is situated beneath the central portion, which is used by pedestrians. It has a superficial area of about 900 square feet, and contains two rooms, about 22 feet by 16 feet, connected by a passage, and having a ventilating chimney. The plant consists of two compressors of the Roots-Ducommun type, each of a capacity of 14,000 cubic feet per hour. They draw the gas from a 12-inch main connected to the ordinary distributing system, and deliver it, at a pressure corresponding to a head of 56 inches of water, into the pipes serving the lamps. Uniform pressure is ensured by two regulators. The compressors can be worked either by a vertical



A. Mantle. B. Head of Bunsen Burner. C. Gas Mixing and Reheating Chamber. D. Flash-Jet. E. Secondary Air Inlet. F. Injector. G. Distance Lighter. H. Primary Air Inlets. I. Supply of Primary Air regulatable by Valve. K. Reflector, with Slit for the Admission of Primary Air and the Manipulation of the Taps. L. Chimney. M. Clear Glass Globe. N. Stopper in Clearing-Hole. O. Gas Inlet.

Graetzin Three-Mantle High-Pressure Lamp.

gas-engine of 10 H.P., or else by a single-phase electric motor of 16 H.P. Details of the compressing station are given on a large plate accompanying the number of the "Génie Civil" containing the article.

The Boulevard Raspail has two roadways, separated by the central walk already mentioned, which is planted with trees. On the edges of this walk four lines of lamp-pillars have been put up, in zigzag order, 115 feet apart. They are in connection with three special lines of pipes, 3¼ inches diameter, two laid under the pavements and the third in the axis of the central walk. The pillars are of the ordinary electric arc type used by the Municipality, and are 14 and 16 feet high. The lamps (Graetzin) are hung upon lyres which have the familiar appearance, but which have been specially prepared for the installation. There are altogether 88 lamps of 1800-candle power, each consuming 39 cubic feet of gas per hour, and 28 of 3600-candle power, consuming 78 cubic feet per hour. Each lamp has a double supply of gas—one for the flash-jet and the other for the two incandescent burners. One of the supplies is furnished with an automatic appliance which, on being acted upon by variations of pressure, turns a tap which opens or closes the inlet of gas to the burner, and another which does the same for the flash-jet. These arrangements cause the extinction of the jet when the burner is lighted, and restore it just before the gas is turned off. It is intended to improve this mechanism so as to effect the simultaneous lighting of the three burners at nightfall, and the extinction of two at midnight and the third at daybreak.

M. Grebel is of opinion that the result of this installation will be the extended use of large incandescent high-pressure gas-lamps in Paris, at all events for the lighting of certain of the wider and more frequented thoroughfares. The effect of this will be to make the electricians bestir themselves to improve their system, if they wish to retain their hold on high-power public lighting.

The Antwerp Small Mechanical Plant Syndicate have organized an exhibition of plant to be held in the city from May 13 to July 13. It is not to be a commercial speculation; the object of the Syndicate being to make masters and workmen engaged in the minor industries acquainted with the progress made in the production and use of small plant, and the profit to be derived therefrom. They will at the same time be initiated into the principles of workshop hygiene. Among the patrons are M. Brender-à-Brandis, the Engineer-in-Charge of the Antwerp station of the Imperial Continental Gas Association, and M. Ad. Kemna, the Manager of the Antwerp Water-Works.

RATING OF GAS AND WATER UNDERTAKINGS,

WITH AN OUTLINE OF GENERAL PROCEDURE OUTSIDE THE METROPOLIS.

By Arthur Valon, Assoc.M.Inst.C.E.

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VI.

Outline of General Procedure Outside the Metropolis.

Assessment Committee.—The Union Assessment Committee Act, 1862, section 2 [25 & 26 Vic., cap. 103] provides for the appointment of a committee by the guardians of every poor law union. The committee is to be appointed at the first meeting after the annual election, and is charged with the investigation and supervision of the valuations to be made within the union.

Preparation of Valuation List.—The above Act also directed the preparation of a list of all the rateable property in a parish, giving the particulars of each property, the gross estimated rental, and the rateable value. [U.A.C. Act, 1862, section 14 and schedule.] Every poor rate, to be valid, must be made upon the rateable value shown in this list, which is called the Valuation List. [U.A.C. Act, 1862, section 28].

Revision of List.—Besides providing for the making of the first valuation list, the Act also directed what was to be done whenever a revision of the existing list was required. [U.A.C. Act, 1862, sections 25 & 26.] The list may be revised in two ways—either by making a completely new list, or by amending the existing list by making what is termed a supplemental list.

Supplemental List.—The valuation list in force may be amended by the preparation of a supplemental list, to be used in substitution for a part of the valuation list in force, or in addition thereto where new property is required to be assessed. This may be done upon the initiative of either the overseers or the assessment committee; the overseers being directed to prepare a supplemental list when

1.—Any rateable property included in the list has increased or reduced in value since the list was made; or
2.—When any property not included in the list becomes rateable; and
3.—Where an alteration in the occupancy of property included in the list takes place, and the property becomes liable to be rated in parts not mentioned in the valuation list, as rateable, and not separately valued in such list. [U.A.C. Act, 1862, section 25.]

while the assessment committee may order a supplemental list on their own initiative where they think it desirable, or, if they think fit, upon the application of any person aggrieved by the list in force. [U.A.C. Act, 1862, section 26.]

New Valuation List.—A new valuation list may be ordered by the assessment committee whenever they think it expedient. [U.A.C. Act, 1862, section 26.] As the preparation and procedure of a supplemental list is the same as with a new list, it will only be necessary to deal with the preparation of a new list.

Making of New List.—When a new valuation list is ordered, the assessment committee may require the overseers to make such list, or, with the consent of the board of guardians, after notice has been sent to every guardian, may appoint a person to do so, and may direct such person to make and sign the valuation list instead of the overseers. The valuation, when made and signed, is sent to the overseers of the parish. [U.A.C. Act, 1862, sections 16 and 26.]

Form of Valuation List.—The form of list prescribed by the Union Assessment Committee Act, 1862, is as follows.

Valuation List for (the Parish or Place for which the List is Made) _____ *in the County of* _____.

Name of Occupier.	Name of Owner.	Description of Property.	Name or Situation of Property.	Estimated Extent.	Gross Estimated Rental.	Rateable Value.

Signed this _____ day of _____

A. B.,
C. D. Overseers of the Poor of the _____ Parish aforesaid.

But by the Agricultural Rates Order, 1896, Article XVI.,

In every parish in which there is any agricultural land as defined by the Act, any new or supplemental valuation list . . . shall be made out in the form shown in Schedule W hereto, instead of being made in the form shown in the schedule to the Union Assessment Committee Act, 1862, and every rate . . . which is now required to be made in the form shown in the schedule to the Parochial Assessment Act, 1836, shall in every such parish be made in the form shown in Schedule Y hereto.

The form for the list is as follows:

Valuation List for (the Parish or Place for which the List is Made) _____ *in the County of* _____.

Name of Occupier. 1.	Name of Owner. 2.	Description of Property. 3.	Name or Situation of Property. 4.	Estimated Extent. 5.	Gross Estimated Rental. 6.	Rateable Value of Agricultural Land. 7.	Rateable Value of Buildings and other Hereditaments not being Agricultural Land. 8.
				A. R. P.	£ s. d.	£ s. d.	£ s. d.

Signed this _____ day of _____

A. B.,
C. D. Overseers of the Poor of the _____ Parish aforesaid.

Deposit of List.—The valuation list having been completed, the overseers have then to deposit it in the place in which rate books are deposited or kept, and forthwith deliver a copy to the board of guardians. [U.A.C. Act, 1862, sections 17 and 27.]

Notice of Deposit.—On the Sunday following the deposit of the list, a written or printed notice of such deposit is to be affixed on or near to the principal or most usual door of all the established churches and chapels within the parish [U.A.C. Act, 1862, sections 17 and 27; the Parish Notices Act, 1837 (7 Will. IV. and 1 Vic., cap. 45) section 2]; and should there be no established church or chapel, then in some public and conspicuous situation. [Poor Rate Assessment and Collection Act, 1869, Amendment Act, 1882 (45 and 46 Vic., cap. 20) section 4.] It is not necessary that the notice should be affixed to the doors of Nonconformist chapels. [Ormerod *v.* Chadwick, 16 M. and W. 367.]

Inspection of List.—As soon as the list is deposited, every person assessed, or liable to be assessed to the relief of the poor of such parish, is entitled to inspect it at all reasonable times on payment of one shilling, and to receive a copy, either of the whole or part, on payment of 6d. for every 24 names [U.A.C. Act, 1862, section 17; Poor Rate Act, 1743, section 2], or may *take* copies or extracts free of charge. [Parochial Assessments Act, 1836 (6 & 7 Will. IV., cap. 96), section 5.]

Transmission of List to Committee.—At the expiration of 14 days from the time of the notice given of the deposit of the list, the list is to be sent to the assessment committee. [U.A.C. Act, 1862, section 17.]

Inspection of List after Transmission.—Any overseer or other ratepayer within the union has the right of inspection and taking copies of and extracts from any list transmitted. [U.A.C. Act, 1862, section 17.]

Notices to Railway and Other Companies.—Within fourteen days of the transmission to the assessment committee of any valuation or supplemental valuation list, the committee must give notice to every railway, telegraph, canal, gas, and water company named in the list as the occupier of any property, and not having any office or place of business in the parish to which the list relates, of the rateable value of the property. Such notice may be served by post to the principal office, or one of the principal offices where there may be more than one. [U.A.C. Amendment Act, 1864 (27 & 28 Vic., cap. 39). section 5.]

Committee may make Alterations in List.—The assessment committee may, in their discretion, make alterations in the valuation list either before or after hearing an objection, or even where no objection has been made. [U.A.C. Act, 1862, section 20.]

Approval of Amended List.—When all the objections have been

heard, and the committee have made the alterations they think fit in the list, it must be approved under the hands of three members present at the meeting at which it is approved, with the date of the approval. [U.A.C. Act, 1862, section 20.]

Re-Deposit of List.—If any alteration has been made in the list, then it must be redeposited for inspection in the same way as the valuation list when first made by, or delivered to, the overseers as before described, and with similar notice. [U.A.C. Act, 1862, section 21.] But when a list has been amended under section 1 of the U.A.C. Amendment Act, 1864, which gives power for an objection to be made after the final approval of the list, it is not necessary that it should be redeposited by the overseers. [*R. v. Edmonds* (1874) L. R. 9, Q. B., 598.]

Deposit and Inspection after Final Approval.—The valuation list, after final approval, is to be deposited at a convenient place appointed by the Board of Guardians, in the custody of the clerk; and it is to be open at reasonable times to the inspection of any of the guardians and of any overseer of a parish within the union without charge, and of any ratepayer within the union on payment of one shilling. [U.A.C. Act, 1862, section 31; Poor Law Amendment Act, 1868, section 30.] A copy, signed by the three members of the committee who approved of the same, and countersigned by the clerk of the committee, is to be delivered to the overseers, and is to be preserved in the same place and in the same custody as the rate books. [P.L.A. Act, 1868, section 30.]

Valuation List in Force.—After this list has been approved and delivered to the overseers of the parish, it becomes the valuation list in force in such parish until a new valuation list is made. Should a supplemental list be made at any time, then the original list, as amended by the supplemental list, becomes the list in force. [U.A.C. Act, 1862, section 24.]

Inspection of Copy of List.—The copy of the list delivered to the overseers is open to inspection in the same way as the rate-books. [U.A.C. Act, 1862, section 23.] By the Poor Rate Act, 1743, the overseers must permit every inhabitant of the parish to inspect the rate at all reasonable times on payment of 1s., and must, upon demand, give copies of the rate, or any part thereof, on payment at the rate of 6d. for every twenty-four names. And by the Parochial Assessments Act, 1836, section 5, any person or persons rated to the relief of the poor may, at all reasonable times, take copies of or extracts from the rate without paying anything for the same.

Rate to be in Conformity with List.—The valuation list, having been finally approved by the committee, all poor rates must be made in strict conformity with the list. [U.A.C. Act, 1862, section 28.]

Poor Rate.—The duty of looking after the poor falls now upon the guardians of the union, who have power to call upon the overseers for whatever funds they find necessary, and the overseers must make a rate sufficient to provide the requisite amount.

Basis of Poor Rate.—The amount which each person has to contribute must be calculated upon the annual rateable value shown in the valuation list in force, and no rate will be valid unless the hereditaments included therein are according to such rateable value appearing in the list. [U.A.C. Act, 1862, section 28.]

Particulars of Rate.—The overseers are to state in the title of the rate the period for which it is estimated, but if necessary another rate may be made before the expiration of the period mentioned. [Poor Rate Assessment and Collection Act, 1869, section 14.] They have also to insert in the rate the names of all occupiers. [Poor Rate Assessment and Collection Act, 1869, section 19.]

Form of Poor Rate.—The rate must be made in a specified form. Until the year 1896, the form was dictated by the Parochial Assessments Act, 1836. But the Agricultural Rates Order, 1896, provided for special exemptions in regard to agricultural land; and to give effect to this it was necessary to divide the value of the land and the buildings. A new form was therefore directed to be used in any parish containing agricultural land, the form being as follows:—

Form of Rate to be Substituted for the Form in the Schedule to the Parochial Assessment Act, 1836.

An assessment for the relief of the poor of the parish of.....in the county of.....and for other purposes chargeable thereon according to law, made this.....day of.....in the year of our Lord.....after the rate of.....in the £ on buildings and other hereditaments not being agricultural land, and at one-half of the said rate on agricultural land which is estimated to meet all the expenses for the above purposes which will be incurred before the.....day of..... next.*

No.	Name of Occupier.	Name of Owner.	Description of Property.	Name or Situation of Property.	Estimated Extent.	Gross Estimated Rental.	Rateable Value of Agricultural Land.	Rateable Value of Buildings and other Hereditaments not being Agricultural Land.	Rate at ..d. in the £ on Agricultural Land and at ..d. in the £ on other Hereditaments.
1.	2.	3.	4.	5.	6	7.	8.	9.	10.
					A. R. P.	£ s. d.	£ s. d.	£ s. d.	£ s. d.

* If a rate is made payable by instalments the amount of each instalment and the date at which each instalment is payable are also to be set forth in the heading.

Declaration.—The overseers have to add the following declaration to the rate, before it is allowed by the justices. [U.A.C. Act, 1862, section 28.]

We, the undersigned, do hereby declare that one of us, or some person on our behalf, has examined and compared the several particulars in the respective columns of the above rate with the valuation list made under the authority of the Union Assessment Committee Act, 1862, in force in this parish (or township); and the several hereditaments are, to the best of our belief, rated according to the value appearing in such valuation list.

This declaration is necessary to make a good rate, as without it the rate would be of no force or validity. [Parochial Assessments Act, 1836, section 2.] It has been held that where a special form of proceeding is given under a Local Act, that form must be followed and not the one given in the General Acts.

Justices to Approve Rate.—Under the Act of Elizabeth [Poor Relief Act, 1601], the rate had to be made by and with the consent of two or more justices of the peace, which consent is now called the allowance of the rate. Provided that the rate is in the proper form, the declaration properly signed, and it is made by the proper authority, the justices cannot refuse to allow the rate.

Publication and Inspection of Rate.—It was not until the Poor Rate Act, 1743, that any provision was made for the publication of the rate. The provisions now in force as to publication and inspection are the same as for a Valuation List.

Distress for Non-Payment.—The rate, having been published, is payable on demand, and failing payment, distress warrants can be issued. [Poor Relief Act, 1601, section 2.] Should an appeal be pending, notice of which has been given, the person liable for payment of the rate cannot refuse to pay any less sum than that at which he was rated in the last effective rate [Poor Rate Act, 1801, section 2], and distress can be issued up to this amount.

Appeal Against Valuation List and Rate.

General.—A right of appeal to Quarter Sessions against a rate was given by the original Act of Elizabeth [Poor Relief Act, 1601]; and in various enactments since, the right of appeal has been preserved and extended, and the procedure more exactly prescribed. By the Parochial Assessments Act, 1836, justices acting in petty sessions were directed to hold a special sessions for hearing appeals against the rates at least four times in every year. In the Union Assessment Committee Act, 1862, which provided for the preparation and amendment of a valuation list, it was laid down that an objection to such list might be made to the assessment committee, who were empowered to give such relief as they thought fit. The Amendment Act of 1864 provided that no appeal against a rate could be made to sessions unless an objection to the valuation list had been made to the assessment committee and the objector had failed to obtain such relief as he thought himself entitled to. So that at the present time anyone who is not satisfied with the amount at which he is rated must first object to the assessment committee. Should he not obtain a sufficient reduction on account of this objection, he may then, when a rate is made upon the list, appeal to either special sessions or quarter sessions. Special sessions are petty sessions held on a particular day for a particular purpose.

Objections Against the Valuation List.

Who may Object.—Under the Union Assessment Committee Act, 1862, objection against the valuation list may be made to the assessment committee by:—

(1) Any overseer of any parish who shall have reason to think that such parish is aggrieved by the valuation list of any parish within the union; or

(2) Any person who may feel himself aggrieved by any valuation list on the ground of unfairness or incorrectness in the valuation of any hereditaments included therein, or on the ground of the omission of any rateable hereditament. [Section 18.]

Time for Objecting.—This objection must be made within 28 days of the notice of deposit of the list being posted up on the church door [section 18]. But under the Union Assessment Committee Amendment Act, 1864, notice of objection to the assessment committee may be made at any time [section 1], as a condition precedent to an appeal to sessions against a rate; so that should the ratepayer not have objected within the 28 days required by the 1862 Act, he can object at any time under the Act of 1864. Although the Act of 1864 says "at any time," it is somewhat doubtful if this would enable anyone to object to a rate after a considerable interval had elapsed, and where other rates had been made subsequently, and it is advisable to give notice of objection

as soon as possible after the rate is made. [See *Imperial and Grand Hotels Company, Limited, v. Christchurch Union* (Konstam's Rating Appeals, Vol. I. 1904-1908), p. 167.]

Grounds of Objection.—The grounds upon which objection can be made to the list under the 1862 Act are "unfairness or incorrectness in the valuation of any hereditaments included therein, or on the ground of the omission of any rateable hereditament." But under the 1864 Act, as an objection to the list must be made before an appeal against the rate can be made to sessions, it is necessary to object to the list before the Committee, even though the grounds are other than those stated above, and the assessment committee have no power to deal with the matter. [*R. v. Lancashire*, J.J. (1874) 43 L.J.M.C. 116. *Williams v. Bedminster Union* (1874) 39 J.P., 117; 30 L.T., 710.]

Notice of Objection.—A notice of objection must be sent in writing to the committee, and also to the overseers. This notice must specify the grounds of objection, and if the objection is to the valuation, or the omission, of any property in respect of which any person, other than the objector, is liable to be rated, a similar notice must also be sent to such person. [U.A.C. Act, 1862, section 18.]

Certain powers of the overseers, in the case of rural districts, have been transferred to the parish councils; and notice of appeal in the case of an appeal against a rate must be given to them [Local Government Act, 1894.] It is doubtful whether this is the case in regard to objections against the valuation list, except objections made by the overseers themselves. It is, however, wise for the objector to make himself secure by giving notice both to the overseers and to the parish council.

These powers may also, by special order of the Local Government Board or by the county council respectively, be transferred to the council in the case of municipal boroughs or urban districts [Local Government Act, 1894, section 33 (1)], and to the parish meeting in rural districts not having a parish council [Local Government Act, 1894, section 19 (10)]. It is therefore necessary to inquire as to whether an order has been made, and, if so, the exact terms of the order, so that the proper notices may be given; but if this is inconvenient, the trouble can always be obviated by serving the notice.

Care must be taken that all the grounds of objection are stated in the notice, as should it be afterwards decided to appeal to sessions against the rate nothing can be raised which is not covered by the grounds stated in the notice of objection to the valuation list. It is not necessary to state in the notice of objection the amount which the objector considers to be fair. Where an objection has been made to the valuation list before the rate is made, an appellant can appeal to sessions immediately after the rate is made without further objection to the list. [*R. v. Wiltshire*, J.J., 4 Q.B.D. 326.]

The notice of objection against the list may, as already mentioned, be given "at any time;" and if an objection has been made, and the assessment committee have granted some relief, but not so much as the appellant considered he was entitled to, it is not necessary for a further objection to be made to the list to entitle the objector to appeal to sessions against the rate as amended. [*R. v. Derbyshire*, J.J., 25 L.T. 43. *R. v. Denbighshire*, J.J., 15 Q.B.D. 451]. Should, however, an appeal be against a second rate based on the same valuation list, although it is not quite clear whether it is absolutely necessary for a further objection to be made to the valuation list—and there are some cases which go to show that it is not necessary—it would seem to be reasonable, and would certainly be a wise precaution to take. This would be particularly so where the value had altered since the date of the objection before the assessment committee.

Signing of Notice.—In the case of a company, the notice should be signed by the secretary, if duly authorized, or perhaps preferably by the solicitor.

Serving of Notice.—(*a*) To the ASSESSMENT COMMITTEE: The notice to the assessment committee may be left at the office of the clerk to the guardians, or sent through the post office addressed to the committee at such clerk's office, or may be delivered personally to the clerk, or at his usual place of abode. [U.A.C. Act, 1862, section 42.]

(*b*) OVERSEERS: Notice should be delivered personally; if sent by post, the objector takes the risk in case the notice does not reach the overseers.

(*c*) THIRD PERSON: In the case of a third-person notice should be delivered personally.

(*d*) PARISH COUNCIL: In the case of a parish council, notice may be given to the clerk to the council in the same way as the notice to the overseers. [Local Government Act, 1894.]

The person serving the notice should make a note of the time and place of his doing so, in order to be able to give proof if necessary at the hearing of the appeal. If the necessary notices of objection have not been given, the committee may not hear the objection without the consent of those entitled to notice; but even with this consent, it is within the discretion of the committee. [U.A.C. Act, 1862, section 19.]

Meetings of Committee to Hear Objections.—The assessment committee must hold such meetings as they think necessary for hearing objections to the valuation lists, and must give to the overseers of the several parishes to which the lists relate 28 days' notice of the meeting. The overseers must then, on the Sunday following the receipt, publish the notice by affixing it at or near to the church door. It is usual for the clerk to give a notice of the meeting to the persons objecting; but this is a matter of courtesy, and not of right. [U.A.C. Act, 1862, section 19.]

Appearance before Committee.—An objector need not appear in person before the assessment committee, but can be represented by someone on his behalf. [*Reg. v. S. Mary Abbots, Kensington*, 1891. 1 Q. B., 378.] If it is impossible for the objector, or a qualified agent, to attend. someone shonld appear on his behalf and ask for an adjournment. In case this is refused, the person appearing should then make formal objection at the meeting to the list. As it is not necessary to call any evidence, this would be sufficient should the objector desire to appeal to sessions.

Evidence before Committee.—The committee have no power to examine witnesses on oath. When anyone appears before the committee, he is not compelled to produce any evidence [*R. v. Essex*, J. J. (1882), 46 J. P., 724.], but apart from the fact that this might very well result in the objector not obtaining the relief he hoped for, it might also prejudicially affect the question of costs if he afterwards appealed to sessions against the rate. Therefore, it is advisable to lay before the committee as much evidence in support of the objection as can be done without detriment to the objector's case should he intend, failing satisfactory relief, to carry the matter to sessions.

After the case has been laid before the Committee, it is usual for them to request the objector to retire while they consider the matter. When they have arrived at a decision, the objector is recalled and their decision communicated to him.

Where rating experts are employed on both sides, it is quite common for the committee to allow the matter to be discussed in private between them to see if it is not possible for them to arrive at a satisfactory decision. Of course, any agreement does not bind the committee to accept it; but as a matter of practice, this usually follows.

Hearing of Objections to Altered List.—When all the objections have been dealt with, and the list has been redeposited, the committee must appoint a day, not less than seven days nor more than fourteen days from the redeposit, for the hearing of objections to the altered list. [U.A.C. Act, 1862, section 21.]

OILS AND TARS TO PREVENT MOULD GROWTH.

A recent number of the "Journal of the Society of Chemical Industry" contained a paper, read before the New York Section of the Society by Mr. J. M. Weiss, on "The Action of Oils and Tars in Preventing Mould Growth."

The materials selected for trials for antiseptic effect were American and German coal-tar creosote, water-gas tar distillate, undistilled coal tar, and undistilled water-gas tar. The results of the tests showed that coal-tar creosote prevents mould growth very much better than the corresponding water-gas tar product; indeed, the author says the latter has only one-sixth the efficiency of the coal-tar oil. Advocates of the use of water-gas tar frequently state that prejudice against it exists in favour of coal-tar creosote; and this prejudice appears to be well founded. The difference between the German and American creosote samples was not so marked, but was considerable, since it took one-third more of the former to produce the same antiseptic effect. The author thinks this difference may be due to several causes—the higher percentages of tar acids, naphthalene, or lower boiling constituents in the American creosote. The precise reason cannot be stated. A creosote oil of pure coal-tar origin, free from all acid and basic bodies, from which almost all the naphthalene had been removed, has been prepared, also known mixtures with tar acids, pyridine, and naphthalene, to ascertain the effect of variously prepared oils on mould growth. From data thus obtained, the author hopes to determine the portions of coal-tar creosote which are antiseptically most efficient and desirable for the purposes of wood preservation. The facts established are: (1) That coal-tar creosote is much stronger antiseptically in preventing mould than water-gas tar distillate; (2) that the former is antiseptically more efficient in about the proportion of six to one; and (3) that the same relative antiseptic efficiency holds good with undistilled tars.

Japan Institute of Gas.

In view of the recent development of the gas industry in Japan, there was lately formed in Tokyo the "Japan Institute of Gas," to protect the interest of gas and kindred industries, encourage the study of its scientific aspect, and incidentally act as advisers in matters of the installation of plants and in gas engineering generally. The Institute propose to issue a monthly journal. It is interesting to note that in Japan the electrical development has been phenomenal; so that gas seemed almost lagging behind. But now the great stimulus given by the increasing demand for gas as light and motive power, and the facility of abundant coal supplies, render the future of the Japanese gas industry full of promise. There are, at present, about thirty gas companies in the country, and a similar number in course of formation.

The late Mr. Edward Filliter, formerly of Leeds, whose death, at the age of 85, was recorded in the "JOURNAL" for the 24th of January last, left estate of the gross value of £66,471, with net personalty amounting to £66,340. Subject to certain life interests, the testator makes a bequest to the Leeds University.

VICTORIAN GAS MANAGERS' ASSOCIATION.

Fifth Annual General Meeting—Nov. 2 and 3, 1910.

The Fifth Annual Meeting of the Association was held in the rooms of the Victorian Institute of Engineers, Swanston Street, Melbourne, on Wednesday, Nov. 22; over thirty members being present. Owing to the absence of the President (Mr. P. C. Holmes Hunt), who was on a visit to England and the Continent, Mr. S. E. Figgis, of Ballarat (ex-President), occupied the chair.

The minutes of the previous meeting were taken as read, and adopted.

Report of the Council and Balance-Sheet.

The Acting President said the members had had the report of the Council and the balance-sheet, and they had seen from the latter the excellent financial position the Association was in.

The report and accounts were received and adopted.

Letters from the President.

The Secretary (Mr. C. W. Howlett, of South Melbourne) said he had received a cablegram from the President, as follows: "Best wishes for successful meeting." He had also had a letter from him from Manchester, dated Sept. 7, 1910, in which he expressed his regret that, owing to his being extremely busy in following up the carbonization question, he found it would be quite impossible to return in time to preside at the annual meeting of the Association. Mr. Hunt, however, hoped that the meeting would be held as usual; and he promised to contribute, at the meeting to be held next November, a paper on the latest forms of carbonizing installations. In a previous letter, Mr. Hunt had written saying that, as the President of the Victorian Gas Managers' Association, he had been kindly received by the Institution of Gas Engineers, and by the Société Technique de l'Industrie du Gaz en France and the Belgian Association of Gas Managers.

The Acting President said the latest he had heard from the President was that he was standing before a retort at Dessau, Germany, carbonizing Newcastle coal.

The Secretary (continuing) referred to other communications which had come to hand; and it was resolved that the correspondence be received.

New Members.

The Secretary then read the following nominations for membership, as approved by the Council:—

T. H. Barson, Manager of the Broken Hill (N.S.W.) Gas-Works.
M. Allen, Manager of the Hobart (Tasmania) Gas-Works.
L. Taylor, Manager of the Benalla Gas-Works.
H. E. Bean, Manager of the Warragul Gas-Works.
E. Hart, Assistant-Manager of the Oakleigh Gas-Works.

The four first-named gentlemen were unanimously elected members, and the last a junior member.

Acting President's Remarks.

The Acting President said he was sure that all the members shared with the Council the regret they felt at the absence of their esteemed President. When he left for England in April last, on important business connected with the Metropolitan Gas Company, it was thought possible that he might be able to return in time to occupy the chair at the present meeting. No one would regret his absence more than Mr. Hunt himself, as he (Mr. Figgis) knew he was anxious to place before the members information that would have proved both instructive and interesting. They trusted, however, that at no distant date he would be able to give them some of the results of his visit to Europe. The Council, seeing that Mr. Hunt's absence was inevitable, desired him (Mr. Figgis) to perform the duties of Acting President; and he had undertaken them on the understanding that no address would be required. It was gratifying to note that managers outside the State were expressing a desire to join the Association; and two gentlemen —Mr. Barson, of Broken Hill, New South Wales, and Mr. M. Allen, of Hobart, Tasmania, both of whom were present at the meeting last year—had been elected as members. The membership roll was still on the increase, and the credit balance shown on the balance-sheet testified to the sound financial position of the Association; and it was especially gratifying to find that the book of "Transactions" was asked for and read by managers in other States. Since the last meeting, the gas industry, in company with many others, had passed through a most trying ordeal in the shape of a coal strike of unprecedented severity. He was afraid that neither the public nor the gas consumers realized the strain put upon the companies to meet the requirements of their customers, and minimize discomfort and inconvenience. But it was a matter for congratulation that engineers and managers rose to the occasion, and succeeded, with but very few exceptions, in keeping up the supply of gas. This was only accomplished by the expenditure of much money and a great deal of worry and anxiety; and, as far as Victoria was concerned, it was only right to state that many managers owed a debt of gratitude to the Directors of the Metropolitan Gas Company for the kindly way in which they met their wants in the matter of coal and shale supplies during the period of strain and stress. The aftermath of the great strike was beginning to show itself in a much decreased demand from outside sources for New South Wales coal. It was very doubtful whether such a prolonged strike could ever occur again, as it had been demonstrated that coal supplies could easily be obtained from India, Japan, and elsewhere. The lesson to gas managers was that they must not be content with an eight-weeks' supply of coal on hand, but should endeavour to store at least sufficient to last for three months. The past year had been marked by steady progress in gas manufacture; peculiar interest still attaching to the subject of carbonization. The results obtained were likely to prove of much benefit to the industry, both technically and financially. The advent of the metallic filament electric lamp had acted as a stimulus to experimenters in the gas industry. Their competitors were pushing and active, and had been favoured by some cheap advertisements that had appeared in one of the daily papers. But with the continued improvements in inverted burners, whereby an efficiency of 20 to 30 candles per cubic foot of gas at ordinary pressure, and upwards of 60 candles at high pressure, could be obtained, the days of gas lighting were not yet numbered. The Australian people were slow in recognizing that, even in public lighting, many of the leading cities of Europe showed a decided preference for gas. The advent of several systems for lighting and extinguishing gas by merely pressing a button tended to make its use popular and economical. The maintenance of burners and mantles at cost price obtained with many companies; and he was of opinion that in the near future a system of night inspection would be adopted which would still further tend to ensure for the consumer the very highest possible duty to be obtained from his gas supply. It was true that many gas managers had to face active competition in electricity. But they realized that, for beauty and steadiness of light, no electric light was comparable to a good inverted burner; while the question of cost had never been in doubt. In this connection, they were promised some extremely interesting results of comparative tests which had lately been made in Melbourne of the best gas and electric burners. There was an immense field still open for the supply of gas for cooking, heating, and motive power; and it was pleasing to know that not only in the large cities but in many of the small towns this field was being exploited with excellent results. In conclusion, he expressed the hope that the Association would continue to make progress in its career of usefulness, and that the meetings would prove a source of much interest and instruction to the members.

Thanks to the Acting President.

Mr. G. Swinburne (Melbourne) moved a vote of thanks to Mr. Figgis for kindly coming forward to occupy the chair in the absence of the President, and for preparing for the meeting the remarks he had made. As they all knew, Mr. Figgis had been a very strong advocate of the Association from the start, and was one of its bulwarks. Everyone must feel that the absent President was doing very useful work for the Associatian. Mr. Hunt was having the opportunity of a lifetime—visiting Canada, America, and Europe, and there absorbing general knowledge and technical information which must be of immense advantage to the Gas Company he represented, as well as to the Association.

Mr. T. Lord (Geelong), in seconding the motion, said he quite endorsed the remarks made by Mr. Swinburne.

The motion was carried by acclamation.

The Acting President thanked the members for their appreciation, and especially Messrs. Swinburne and Lord for their kindly remarks.

Mr. Hunt's Account of His Journey.

Mr. Swinburne then moved that the Association record a hearty vote of thanks to the President for his cablegram. He said it was very thoughtful of Mr. Hunt, while he was away, to remember the Association, and send his best wishes for a successful meeting. Probably Mr. Hunt would be pleased to write some *résumé* of his trip for inclusion in the "Transactions" of the current year, so that members could get from the report as much information as possible. If it were conveyed to Mr. Hunt, somewhere *en route*, that the Association desired that he would prepare such a record, probably he would have it ready by the time he reached Melbourne. He made the suggestion because he thought Mr. Hunt would have so much to tell them as the result of his trip that he might put it into two papers—one for an immediate presidential report, and the other for an address at the next meeting dealing with some of the more technical matters.

Mr. W. Frost (Mornington) seconded the proposals, and they were carried.

The Secretary said he thought he should be able to inform the President of the vote of thanks and the wishes of the Association, either in London or at some point on the way out. The next "Transactions" would, if possible, be got out a little earlier than usual; and members would have the benefit therein of what Mr. Hunt had to say.

Papers and Discussions and the "Question-Box."

The reading of papers, of which there were two—the first by Mr. J. A. Ambrose, of Heidelberg, on "The Progress and Development of a Municipal Gas-Works;" and the second by Mr. J. Bowman, of Sale, on "Differential Prices for Gas"—was then proceeded with. Both gave rise to good discussions. These were

followed by the consideration of the contents of the "Question-Box," which comprised five subjects. The papers had not reached us in time for publication in the present issue of the "JOURNAL;" so that, with the report of the discussions upon them and the remarks upon the questions, they are held over till next week.

ELECTION OF OFFICERS.

The ACTING PRESIDENT said that, in accordance with the Council's nomination, he had much pleasure in proposing that Mr. Thomas Lord, of Geelong, be elected President for the ensuing year.

Mr. G. SWINBURNE (Melbourne) seconded the motion; and it was carried unanimously.

Mr. LORD thanked the members sincerely for the honour conferred upon him, and said he trusted his endeavours would keep up the reputation of the Association.

The other officers appointed for the year 1910-11 were as follows:—

Vice-President.—Mr. D. Warren, of Footscray.

Member of Council.—Mr. W. Pain, of Bendigo (re-elected).

Auditors.—Messrs. J. Bowman, of Sale, and J. Lord, of Williamstown.

Hon. Sec. and Treasurer.—Mr. Chas. W. Howlett, of South Melbourne.

PLACE OF NEXT MEETING.

It was then decided that the next annual meeting should take place in Geelong on the 8th and 9th of November.

VOTES OF THANKS.

Mr. D. WARREN (Footscray) moved that a hearty vote of thanks be accorded to Mr. Figgis for the able manner in which he had presided over the meeting, in the absence of the President.

Mr. LORD (Williamstown) seconded the motion, which was supported by Mr. GEORGE SWINBURNE (Melbourne), and carried unanimously.

Mr. FIGGIS briefly thanked members for the kindly sentiments expressed.

Votes of thanks were also passed to the Metropolitan Gas Company and their Officers for their hospitality, and to the Victorian Institute of Engineers for the use of their rooms.

The proceedings then terminated.

EXCURSIONS AND ENTERTAINMENTS.

At the close of the first morning's session, the members were entertained at luncheon at the Continental Café by the Metropolitan Gas Company. Mr. George Swinburne, one of the Directors, occupied the chair, and was supported by Mr. John Hinde, the Secretary of the Company. After the toast of "The King" had been honoured, Mr. Figgis proposed the health of the Metropolitan Gas Company, coupled with the names of Mr. Swinburne, the Secretary, and the Engineer (Mr. P. C. Holmes Hunt). Mr. Hinde suitably replied.

VISIT TO THE HEIDELBERG GAS-WORKS.

After luncheon, the party were driven to Heidelberg, where they were entertained by the Manager, Mr. J. A. Ambrose, and an inspection was made of the gas-works. The retort-house is 40 feet long and 26 feet wide, and contains three benches of four and one bench of three round retorts, 16 inches diameter and 8 ft. 3 in. long, built on the shallow regenerator system. After leaving the retort-house, the gas passes through a set of vertical condensers, and thence through a 5-inch steam jet exhauster. It is then conveyed across a road to the new plant, which comprises two sets of horizontal condensers, a Livesey washer of a capacity of 250,000 cubic feet per 24 hours, and three purifiers 10 feet square with 10-inch connections. Messrs. Clayton, Son, and Co., Limited, of Leeds, were the manufacturers of the plant. The station meter, supplied by Messrs. J. & J. Braddock, of Oldham, has a capacity of 15,000 cubic feet per hour. There are two gasholders—the larger one being 70 feet in diameter and 20 feet deep, and capable of storing 70,000 cubic feet of gas; the smaller one having a capacity of 10,000 cubic feet. Two governors are installed—a 10-inch, by Peebles, which controls the night consumption only, and a 6-inch, by Braddock, which is in operation during the day.

VISIT TO THE BOX HILL GAS-WORKS.

After leaving the Heidelberg works, the members were driven across country to the Box Hill works of the Colonial Gas Association, where they were formally received by the Hon. George Swinburne, the Managing-Director, and Mr. E. Tipper, the Works Manager, under whose guidance the inspection was made. The works are situated midway between the townships of Box Hill and Surrey Hills; and they supply these two districts, as well as Canterbury, Mont Albert, and Balwyn. On the right of the entrance gates are placed the office, show-room, manager's house, and workmen's cottages; on the left, standing well back from the road, are the retort-house, coal-store, and condensing plant.

The retort-house contains four settings of six retorts each; two being full-depth and two half-depth regenerators. Each bed has a separate section of hydraulic main fitted with tar-column, allowing a correct and fine seal adjustment. Extensions of the arches, settings, and a new stack were in course of erection at the time of the visit. The engine, exhauster, and pump rooms are arranged in a brick building behind the retort-house. The exhauster is driven by means of a gas-engine, which also provides power for working the tar, liquor, and water pumps. The condensing and scrubbing plant is housed in a louvre wooden building. The condensers are of the annular type, surrounded by a catch-pit for the sprinkler water, which is pumped from the bottom of the holder tank, and returns by gravitation after being used. The present station meter house, also contains the governors, pressure recorders, &c. The house, however, is being enlarged in order to accommodate a larger station meter, which is necessary to cope with the increasing output of gas. Two single-lift holders are in use—the smaller for the day load, and the larger for the night service. A testing-room, meter, fitters' and blacksmiths' shops, stores, and stables are conveniently arranged on the works.

After the inspection, the visitors were entertained at afternoon tea by the Colonial Gas Association. Mr. Figgis proposed the health of the hosts, coupled with the name of Mr. George Swinburne, and expressed gratification at the manner in which the members had been received. Mr. John Hinde, in supporting the toast, said that, as a visitor, he was very pleased to record his thanks. Mr. George Swinburne was a very busy man; and the fact that he could spare time to entertain members and visitors showed how interested he was in the gas industry. Mr. Swinburne, in reply, said he was very proud indeed to have the opportunity of seeing the gas managers of Victoria at Box Hill. Of all the positions he had occupied, none absorbed his interest so much as the gas industry. It was a great pleasure to him to be able to attend the meetings of the Association. Mr. J. Bowman proposed the health of Mr. Tipper, the Works Manager. The toast was enthusiastically honoured; and Mr. Tipper responded.

The members and visitors were then driven back to Melbourne.

ASSOCIATION OF ENGINEERS-IN-CHARGE.

Annual Dinner.

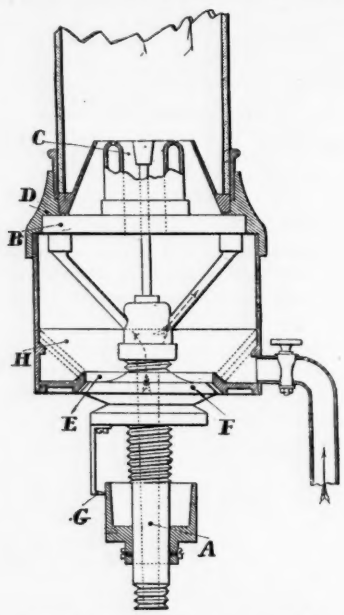
The Annual Dinner of the Association took place on Saturday, in the King's Hall at the Holborn Restaurant, under the chairmanship of Captain H. Riall Sankey, M.Inst.C.E., the President; the vice-chair being occupied by Mr. A. E. Penn, the Chairman of the Association. There were a number of well-known names among the party of about three hundred who sat down; and the speeches (interspersed with music and song) were much enjoyed.

The Loyal Toasts having been duly honoured, the toast of "The Association" was proposed by his Honour Judge Rentoul, K.C., LL.D., who remarked that the position of engineer, in all branches, was one of immense responsibility; and it was a profession which was of more value to this country than almost any other. It was a profession of which a man might well feel proud, and over which he might well be enthusiastic. The opportunities which such an Association as theirs afforded must tend to uphold a profession which had done such splendid work right over the world. Responding, Captain Sankey said great care was taken in selecting members of the Association. At one time, most of the members resided in London; but recently many had joined from the Provinces and from the Colonies. The main object of the Association was to improve the knowledge and the capacity of the members. Mr. W. H. Patchell, M.Inst.C.E., in submitting the toast of "Scientific Progress," pointed out that in England for many years laboratories were neglected, and foreign countries were said to have gone far ahead of this nation. In many respects, however, they had certainly not done so. The reply was to have been made by Commendatore G. Marconi, LL.D., D.Sc.; but as he was not well enough to attend, his place was taken by Mr. Godfrey Isaacs, the Managing-Director of the Marconi Company, who gave a very interesting account of the progress and prospects of wireless telegraphy. "Our Brethren Afloat" was proposed by Dr. H. S. Hele-Shaw, F.R.S., M.Inst.C.E. (who remarked that no branch of the profession called for so much courage and resource as that of the engineer at sea); and the response was by Engineer Rear-Admiral J. T. Corner, C.B. Mr. W. C. Clifford Smith, M.Inst.C.E., was entrusted with the toast of "Our Guests and Friends." He said the presence of so many men of science showed that the Association met with their hearty approval. Among those who were with them was Mr. H. Percy Boulnois, M.Inst.C.E., the Deputy Engineering Inspector of the Local Government Board, who would very shortly be retiring. He was sure the members would wish him much happiness in retirement. They well knew how arduous his labour had been in the public service; and having regard to the work he had done in connection with the many things which had gone to raise the status of the people and improve the public health, they trusted he would receive some such reward as would be both pleasing to him and satisfactory to the profession to which they all belonged. In response, Mr. Boulnois remarked that it was quite true that he was retiring from the public service, after about forty years' work with the Local Government Board and elsewhere; but he intended afterwards to carry on a private practice. Speaking for the guests, he could say they were always glad to come among the members of the Association, for they realized the importance of their work. The remaining toast was "Our President," proposed by Mr. A. E. Penn, and replied to by Captain Sankey.

PARIS GAS COMPANY'S NEW TEST-BURNER.

The Paris Gas Company have lately patented a burner for use in photometry, in which an endeavour has been made to effect some improvements in the burners at present employed for testing the illuminating power of gas, more particularly in regard to the regulation of the supply of air to the flame. The appliance is described and illustrated in the current number of the "Journal des Usines à Gaz," from which the following particulars have been translated.

The burner consists of a support formed by a hollow column A, by which the gas is admitted. At the extremity of the column are fixed inclined tubes which give access to an annular chamber B and to the crown of the burner C. This is perforated with a number of holes from which the gas issues. For directing the current of air, a button is placed in the centre of the crown, and the whole surrounded by a conical-shaped piece, as shown. The chamber carries a ring D of asbestos fibre, or some other substance which is a non-conductor of heat, to which is adjusted the cylindrical casing, the bottom of which has an opening E to allow of the inflow of air. The quantity of air admitted is regulated by a conical valve F, mounted upon a screw. The position of the valve is shown by the pointer G, which moves over the face of a drum fixed upon the hollow column. This mechanism enables the opening of the valve to be regulated with great nicety.



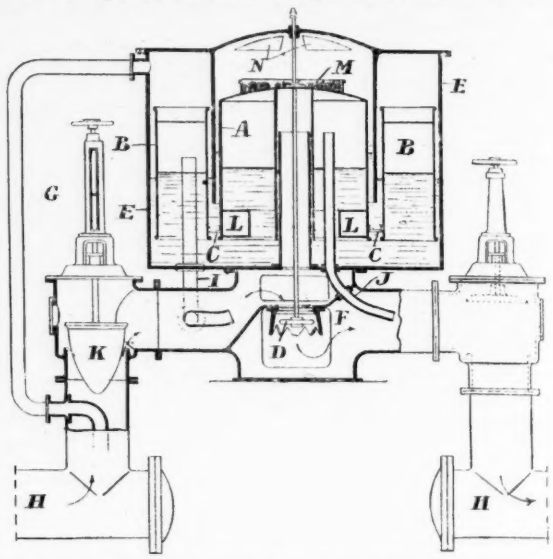
The construction of the new burner allows of the gas being consumed with the proportion of air which produces the greatest luminous intensity, and of its absolute light-giving power being ascertained. It is claimed that with it combustion is effected under the best conditions; the shape of the burner facilitating in large measure the combination of the air and gas issuing from the crown. Another feature is that loss of heat is reduced to the utmost possible extent. As a result of the use of the ring D, the temperature of the case does not rise to any appreciable degree. On the other hand, the inlet-pipe A and the inclined tubes become heated, and convey their heat to the air and gas which feed the flame.

The lower part of the case can be provided with a pipe, furnished with a tap, for conveying the air into the burner, either from a receptacle under pressure, or by means of a fan; the quantity being registered by a meter fixed on the inlet-pipe. In order to regulate the flow of air to the burner, several metallic gratings H are placed in the positions shown. When the burner contains this second arrangement for the admission of air, it can be utilized in two ways. The tap on the inlet-pipe being closed, the air supply can be governed by moving the valve F so as to obtain the maximum amount of light. Or the valve may be closed, the tap opened, and the outputs of air and gas corresponding to the maximum luminous intensity read off upon the meters. The former is working with regulated air, and the latter with measured air.

PRESSURE REGULATOR FOR GAS-MAINS.

A patent has been taken out for France by the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris, for an improved pressure regulator adaptable to any kind of gas-pipe. It is shown in vertical section in the accompanying illustration; and the following descriptive particulars are translated from the French specification.

The regulator consists of two concentric bells A B—the former cylindrical and the latter annular—fastened together by cross-pieces C. They consequently make the same movements as those which they communicate to the clack D of the valve F, suspended from the centre of the bell A. The two bells work in a chamber E, having an internal circular partition, filled with water to a certain level; and they move vertically to the extent required to open or entirely close the valve F. The outer part of the bell B is in communication with the gas-main H by means of a branch-pipe G in front of a plug K, the opening of which can be regulated as required. Below the bell B is a pipe I, by means of which the bell is acted upon by the pressure of gas issuing from the plug K.



The same pressure is exerted at the inlet of the valve F, the clack of which is displaced by the bell A. As this bell is subjected to atmospheric pressure through the openings N in the chamber E, and is connected, by the pipe J, with the outlet-pipe, it follows that, with a given delivery of gas, the two bells produce at the point of exit a pressure which is proportionate to the weight of the bells, *plus* the pressure produced by the difference between the pressures exerted above and below the bell B. This outlet pressure can be regulated as desired, because the weight of the bells can be altered either by the float L or by the ballast M. The degree of pressure exerted on the bell B may be regulated by the extent to which the plug K (the rod of which carries an indicator, as shown) is opened.

The action of the valve is as follows: Supposing the weight of the bells and the loss of pressure through the plug K have been regulated for the minimum delivery of gas, so long as this remains constant the equilibrium of the bells will not vary; and consequently the pressure will not be affected. But as soon as the output increases, the equilibrium will be disturbed, the bell A will drop, and enlarge the opening for the passage of the gas through the valve F. The effect of the increased loss of pressure through the plug K will be a diminution of the pressure under the bell B, with a consequent opening of the valve F. Increased output necessarily causes augmentation of pressure at the inlet of the main served from the regulator. On the other hand, should the output decrease, the pressure at the outlet of the regulator would fall to a corresponding extent.

It is claimed for the regulator that with it, whatever may be the output, a constant pressure can be ensured at any selected spot on the distributing system upon which it is used; but it is suggested that, in the case of ordinary gas, it should be as near the centre of the district as possible.

Cromer Gas Company.—At the annual meeting of this Company last Tuesday, the Directors reported a gross profit of £1496, compared with £1597 for the year 1909. There was a slight advance in the sale of gas; the decrease in the consumption by ordinary meters being more than counterbalanced by the increase in the case of prepayment meters. The profit for the year added to the balance brought forward made a total amount of £1794; and after providing for interest on the debenture stock and on temporary loans, a balance of £1001 was left. After careful consideration, the Directors had decided that it would be very desirable not to pay any dividends until the suspense account had been written off. The carbonizing results had again been satisfactory, the make of gas per ton of coal being upwards of 11,400 cubic feet; and the works had been maintained in good order and condition. The Directors acknowledged with pleasure the value of the services rendered by their colleague Mr. Percy Griffith; and they recommended that a sum of 15 guineas should be again voted to him towards his out-of-pocket expenses. The Chairman, in moving the adoption of the report, expressed regret that the Directors had not a better statement of accounts to put before the shareholders. In the course of the subsequent discussion, various technical and general points were raised, to which Mr. Griffith, on behalf of his colleagues on the Board, replied. A motion was submitted for the appointment of a Committee who should be charged to inquire into affairs; but it was subsequently withdrawn, and the report adopted.

THE BYE-PRODUCT COKING PROCESS AND ITS FUTURE DEVELOPMENT.

COKE-OVEN GAS FOR TOWN ILLUMINATION.

By Ernest Bury, of Skinningrove.

[A Paper read before the Cleveland Institution of Engineers.]

Bye-product coke-ovens cannot be said to have had a very rosy time in our country; and criticism of the industry has been unnecessarily harsh. Since Messrs. Pease and Partners led the way at Crook, in 1881, there has until quite recent years been a never-ending war against the more economic manufacture of coke. It has been variously alleged that the coke from bye-product coke-ovens was inferior to that from the old beehive ovens, and that the recovery of bye-products along with the production of a first-class metallurgical coke was impossible. These statements have, by reason of the big development in the bye-product coking industry, proved absolutely untrue. In 1898, the amount of coal carbonized in bye-product coke-ovens in Great Britain was 1·8 million tons per annum; it is now over 8 million tons. With regard to the unsuitability of bye-product coke for furnace use, the writer is of opinion that now nothing more may be said, and the old prejudice may be laughed at.

During the last year, the plaint against bye-product industry has taken on a different hue. It is not now a question of unsuitability of the coke produce; but that this large amount of bye-product development is going to be the ruin of us, and bye-products are going to suffer. This is an unconscious compliment to the industry whose coke product was supposed to be unsuitable. But let us inquire into the grounds for dread. The most important and valuable bye-product from coke-ovens is sulphate of ammonia, representing as it does from 1s. 7d. to 3s. net per ton of coal carbonized. The following figures of yield taken from the report of the Chief Inspector of Alkali Works, together with the average prices, show how little the large development in coke-ovens during the last seven years has affected the prices of the principal bye-product.

Year.	Total Production of Sulphate from Bye-Product Coke-Ovens.	Total Production of Sulphate from all Sources.	Average Price per Ton of Sulphate of Ammonia.
	Tons.	Tons.	£ s. d.
1903	17,435	233,664	12 9 2
1904	20,848	245,990	12 3 8
1905	30,732	239,114	12 10 9
1906	43,677	289,391	12 0 9
1907	53,572	313,281	11 15 8
1908	64,227	325,228	11 12 0
1909	82,886	349,143	11 5 0
1910	Returns not yet to hand		12 3 2
	Present price		13 6 0

Since in 1891 the price of sulphate of ammonia was only £10 17s. 6d.—*i.e.*, at a time when the sulphate produce from bye-product coke-ovens did not exceed 5000 tons per annum—the extensive growth of the bye-product coke-oven, coupled with other sulphate recovery works (the gas industry, blast-furnace, and producer gas processes), can hardly be said to have threatened the value of the main bye-product. The answer to the apparent paradox is the growing appreciation and demand for sulphate of ammonia as a fertilizer for cereals, sugar, and vine growing—all three important articles of food. With the food supply at stake, there is little chance of this product from coal being put in the background. The only danger would be a cheaper fertilizer; and this is not forthcoming. Certainly there is the possibility of atmospheric nitrate—*i.e.*, nitric acid electrically produced from the atmosphere and combined with lime. But given this possibility (and its production is not great, except with very cheap power), there is room for the two products in the consideration of the world's food supply.

As regards tar and benzol (the other products obtained from bye-product coke-ovens), there has again been an upward recent tendency. Tar has risen from 16s. to 21s. per ton, and benzol (90's) from 6d. to 9d. and 10d. This, again, the writer would suggest, is due to "fresh fields and pastures new." Tar has found an outlet for road dressings, and benzol has developed as a motor spirit; the result being a shortage for the old outlets, which have had to bid against the new usages. In fact, the bye-products process depends for its future developments, as do all other processes, on fresh applications of its products; and to this end the writer offers to the meeting the following considerations: The future of the bye-product coking process lies (1) in the development of the process itself, (2) in the applications of the process.

Developments in the Process Itself.

Recent years have brought forth many improvements which have helped to establish the process. Flue arrangements have been perfected, whereby regular heating of large coking-chambers is produced; the result being even carbonization with minimum repairs to the oven linings. It is safe to say that with a modern design of heating flues, coupled with the choice of a first-class siliceous fire-brick, the minimum life of a bye-product coke-oven lining may be taken at four years; and the chance of serious breakdowns in this direction, such as have occurred in the past, may no longer be considered.

The growing possibilities of coke-oven gas as a source of towns' illumination, power generation, furnace heating, and the like, have furthermore led coke-oven inventors and designers to perfect regenerative systems of oven-heating whereby the process has been resolved into a highly developed heat economizer; so that where 60 per cent. of the gas evolved was required by waste-heat processes for oven-heating, an equivalent quantity is now available for any desired extraneous purpose.

Before proceeding, it may be of interest to you to have some particulars as to the design of a bye-product coke-oven which is now being erected by the Otto-Hilgenstock Coke-Oven Company, at Skinningrove, which, in the writer's opinion, embodies the modern drift of coke-oven design. In the first place, the gas is admitted to alternate sections of flues, not from a common gas flue or duct, but by independent burners, which are accessible and interchangeable from the outside. By this means, there can be no misdirection of the heating gas; and the temperature of the oven walls remains even throughout. In the second place, since the products of combustion, having passed up one section of flues, are drawn down the adjacent flues, as much heat is transferred to carbonization duty as possible. There is, furthermore, the advantage that the products of combustion, instead of collecting in a common flue at the top of the open wall, thereby tending to overheat the oven crown, are immediately withdrawn, and superheating of the crown is minimized. The regenerators, which are 15 feet deep, are tall and narrow, and no opportunity is afforded the gases to cut across corners, which is the case with squat regenerators. Finally, the depth of the carbonizing chamber is considerably higher than that of the flue-chambers. Most of you who are in coke-oven practice will admit that the crown of all coke-ovens gets too hot by radiation from the mass of hot coke during the latter stages of carbonization—an effect which is very harmful, since it produces breakdown of gases, tars, benzol, and ammonia. By increasing the depth of coal beyond the flue depth, the radiant heat will be absorbed in the upper thickness of coal, which, of course, will be carbonized, resulting in a greater all round output of coke, gas, and bye-products per oven, with no further expenditure of heating gas, and at the same time giving a cool crown with greater yields per ton.

The writer believes that as regards the design of the carbonizing chamber itself, very little remains to be accomplished, except that, where the consideration of coke-oven gas for any use is of any moment, the chambers might be heated by producer gas (regenerated if need be) instead of by coke-oven gas as at present. Such method of heating was suggested by the writer at the Dublin meeting of the Institution of Gas Engineers in 1907, and would open up, by employment in modern mechanical producers, the large quantities of refuse small coal which are still thrown to waste, or left in the pits, in many parts of this country. The writer is informed that at one plant in Westphalia, a coke-oven battery is already heated by producer gas from refuse coal, and suggests that there are many cases in Great Britain (the need for coke-oven gas being urgent) where this method of heating would tend to national economy. When all is said and done, it is only the method employed for heating towns' gas-retorts throughout past generations.

The writer has suggested that the design of construction of coke-oven carbonizing chambers has nearly reached its zenith in the type of oven just described; but the chemical aspect of the process offers a far more extensive territory for development and economy. The last two years may be truly said to have marked an epoch in carbonization practice, since inventors have been driven from the worked-out field of oven-design to investigate economies and developments in dealing with the gaseous products resulting from their ovens as carbonization chambers pure and simple. The writer refers, of course, in the first instance to the attempts which have been made to recover sulphate of ammonia direct from the gas-main, without having recourse to the usual method of condensation of the ammoniacal liquor, and the subsequent distillation of the latter in the manufacture of ammonium sulphate.

To students of coke-oven economy, it has always appeared wasteful to cool down from the gases the aqueous vapours containing ammonia, forming part of the distillation products of coke-ovens, and afterwards to reheat these aqueous products to recover ammonia or ammonium sulphate. Such procedure was the reverse of fuel economy; and accordingly Brunck, in 1903, sought to pass the hot uncondensed tarry gases from his coke-ovens direct through sulphuric acid. Brunck's aim was ethically right in seeking to conserve the heat contained in the hot gases from the ovens for the manufacture of ammonium sulphate; but, unfortunately, his object was barred, in so much as the acid became tarry, and dirty sulphate was the result. Furthermore, the tarry products exerted a reducing action on the sulphuric acid, and the sulphurous acid gas produced corroded his gas-mains. The entire process therefore became unworkable.

The next attempt at direct sulphate recovery was that made by Koppers. This inventor avoided Brunck's method of attempting to treat the hot gases, and decided to cool out his tars in the usual manner before the sulphuric acid washing. The vessel containing sulphuric acid, or saturator as it is called, is inserted as a scrubber, through which the tar-free gases are passed; thus eliminating the chances of the loss of ammonia which might occur with liquor or water washing in the usual type of scrubber. The liquors which have condensed in the process of tar removal (containing with wet coal about 80 per cent. of the ammonia) are heated with steam in an ordinary ammonia still, the ammonia and steam from

which are passed into the saturator on the gas-main. In order to avoid condensation within his saturator, Koppers preheats his gases after tar removal, by passing them, before entering the saturator, through a "reheater" or "heat exchanger," through which are passed the hot gases travelling from the ovens to the condensing plant. By his invention, Koppers avoids using the scrubbing water ordinarily employed; thus reducing the amount of liquor requiring to be treated by the ammonia still, and, therefore, the amount of river polluting effluent, which is of serious moment in some parts of the country. Koppers' salt is of good colour, and contains a minimum amount of tarry matters.

The most important development in the treatment of coke-oven gases and in the recovery of tar and sulphate is that devised by Dr. Hilgenstock. The inventor reverts to Brunck's original aim; but instead of passing tarry gases into sulphuric acid, he primarily removes the tar from the hot gases by passage through a tar-spray, the temperature of which is so regulated as to completely remove the tars without effecting the condensation of the greater bulk of ammonia liquor. From the spray, the gases containing the liquors in steam form, together with the ammonia, are passed directly into sulphuric acid, where the ammonia is caught and precipitated as ammonium sulphate. The gases leaving the saturator are free from ammonia, but still contain the liquors as steam, which is carried on to the ovens and boilers and thus dispensed with. In the event of the gases being required for benzol recovery, gas-engine use, or town lighting, the Otto Company employ a fractional method of condensation, whereby the greater portion of the liquor containing very little sulphuretted hydrogen, &c., is precipitated immediately below the dew-point. The remainder of the liquor obtained by completion of the cooling is similar to ordinary spent liquor without, however, containing any lime. Its amount is so small that it can be run off mixed with the coke-slacking water.

Otto's new process dispenses with condensers and water for the same, liquor circulating pumps, liquor cellars and stores, ammonia stills and superheaters, lime mixer, lime pump, settling tanks for spent liquor and drains therefrom, steam connections, and boiler power, thereby effecting a big economy in ground space. The working costs are reduced by the abolition of steam and lime in sulphate making, and trouble in dealing with spent liquor. Finally, all chances of loss of ammonia are reduced to a minimum, since the free or volatile ammonia never leaves the gas-main, and losses by circulation and in the distillation process are avoided.

Several points have been suggested against the Otto method of recovery from the hot gases. In the first place, it has been stated that the temperature of the gases and the reaction heat produced by the ammonia and sulphuric acid in the saturator were insufficient to prevent condensation in the latter, and that external steam had to be supplied to avoid such condensation. The writer has found that this point turns on the percentage of ammonia present in the coal. Very small quantities of condensings containing fixed ammonia salts are produced in the foul-gas mains and sprays; and these have to be worked off in the saturator. If the amount of ammonia in the coal is below the equivalent of 1 per cent. of sulphate, the reaction heat in the saturator is insufficient to evaporate these condensings when put into the saturator, and a small amount of steam has to be supplied to the vessel to keep up the temperature. If the sulphate of ammonia exceeds 1 per cent., the reaction heat is sufficient to evaporate the condensings without need for supplementary steam. Under the worst conditions, the writer found in Westphalia that one ton of steam per ton of sulphate made was required for the Otto saturator; and since eight tons are required for heating up the liquor from the old recovery method, Otto's worst conditions may be said to have effected very great economy. At the first Otto direct recovery plant in Great Britain, where the yield of sulphate of ammonia is 1·5 per cent. on the coal, the writer found the following temperatures:—

Gas entering sprays	93° C.	
Gas entering exhauster (after sprays). .	65½° C.	
Gas leaving exhauster	66° C.	Gain in temperature by reaction heat 4½° C.
Gas leaving saturator	70½° C.	
Gas delivered to ovens	62° C.	

It will thus be seen that, so far from the saturator losing heat, the temperature rises, and there is no need for the application of auxiliary steam in evaporating the condensings; and this is the case for all coals containing 1 per cent of sulphate and over. It has been further alleged that the Otto sprays do not completely remove the tars, and that dirty sulphates would result, as in the case of Brunck. The best answer the writer can give to this statement is to submit a sample of sulphate which speaks for itself. At the six plants which the writer visited in Westphalia, the highest percentage of tar found in the sulphate was 0·22 per cent., the lowest 0·07 per cent. as compared with 0·06 per cent. in sulphate made by the old process.

Some gas engineers have thought that by the passage of the gas through sulphuric acid the calorific value would suffer—presumably through the absorption of heavy hydrocarbons, ethylene, and benzene. At Auchenheath, the writer found the following calorific values on successive days, 596, 602, 599, 608, and 581, B.Th.U. gross per cubic foot. Since modern London coal gas averages about 580 B.Th.U. gross, the writer is of opinion that the weak solution of acid in the Otto saturator has no solvent action on the gas. It has likewise been suggested that at the temperature of the gases leaving the spray, both naphthalene and benzol will be carried forward with the gas. This, the writer found, took place to some extent; but he does not consider it of any moment, since, with coke-oven plant recovering benzol, both products are brought out by the solvent oil. If the gas is required for town lighting, the benzol contributes to the value of the gas; the naphthalene being removed by one of the usual solvents. With further regard to the question of naphthalene, it may be added that one of Krupp's plants, working on the Otto direct-recovery system, is to be used as town gas-works for Bochum; so that no naphthalene trouble is anticipated in this instance.

In the writer's opinion, not one of the least important applications of Otto's new process lies in the facility which it affords for the recovery of ammonium chloride from coals containing a high percentage of common salt. In such event, the condensings found in the foul-gas mains would be collected and concentrated for the recovery of ammonium chloride without passing them into the saturator for conversion to sulphate. The price of ammonia as ammonium chloride is much higher than when combined as sulphate, so that the natural disadvantage of a coal in containing much common salt may be turned to profitable account in this instance.

The Burkheiser Process.

The next important attempt at coke-oven economy has been put forward by Burkheiser, who proposes to utilize the volatile sulphur contained in the coal for the manufacture of the sulphuric acid required for the sulphate of ammonia recovery, incidentally effecting purification of the gases *en route*. As a general rule, the amount of volatile sulphur given off in the form of sulphuretted hydrogen from most coals will produce more sulphuric acid than is required for sulphate of ammonia recovery; the average amount of sulphuric acid obtainable being 40 lbs. per ton of coals.

In Burkheiser's arrangement, the gases coming from the ovens are cooled in the usual manner; the tar and liquors being completely separated from the gas. The liquors are then distilled in the usual type of ammonia still, and the evolved ammonia returned to the gas-main. The dry tar-free gases containing the whole of the ammonia and sulphuretted hydrogen are then passed forward to a small oxide of iron purifier, where the sulphuretted hydrogen is removed by a specially active form of iron oxide prepared by Burkheiser. This purifier is duplicated; one always being at work on the gas-main, the other meanwhile undergoing rapid re-oxidation or revivification by a current of air. By this latter process, the iron sulphide formed in the purification is re-oxidized to oxide of iron; the sulphur going forward as SO_2, which is caught in an "air-scrubber," through which is passed the mother liquor to be described shortly. From the working purifier on the gas-main, the gas, free from sulphuretted hydrogen, passes into the saturator which is fed with saturated liquor from the scrubber, into which the gas passes after leaving the saturator. Precipitation of ammonium sulphite takes place in the saturator, the salt is whizzed, and the mother liquor drainings are sent to the "air-scrubber" to take up more SO_2 from the revivifying oxide. In the air-scrubber, the neutral ammonium sulphite in the mother liquor takes up SO_2 according to the following reaction:

$$\frac{NH_4}{NH_4}>SO_3+SO_2+H_2O=\frac{NH_4}{H}>SO_3+\frac{NH_4}{H}>SO_3$$

This acid ammonium sulphite solution is then sent to the ammonia scrubber, through which are passed the gases coming from the saturator. Here the acid ammonium sulphite takes up the last of the ammonia, forming some neutral ammonium sulphite, and then into the saturator, where it is met by the bulk of the ammonia in the gas to be treated. In the saturator, the acid sulphite is completely changed to the neutral ammonium sulphite, which precipitates out in the manner aforesaid; the mother liquor being returned to the air-scrubber to take up more SO_2, and so on to repeat the cycle of operations.

The ammonium sulphite is converted to ammonium sulphate by repeated sublimation and oxidation in a revolving drum. Burkheiser has improved on this, his original scheme, by passing his SO_2 from the purifiers, together with excess of air, over strongly-heated iron oxide in a contact chamber, and thus converting the SO_2 to SO_3. On subsequently washing the gas with this SO_3 liquor, he obtains ammonium sulphate direct, without the need for oxidation of the sulphite as in the former instance.

There are several important points about Burkheiser's process which are of interest to everyone connected with carbonizing plants of any kind. In the first place, the natural sulphur content of the coal is utilized to manufacture sulphuric acid for sulphate recovery, representing a sum of from 30s. to 35s. per ton in the cost of manufacture of the latter product, besides affording a home-made supply to plants that are distant from sulphuric acid works. Secondly, the recovery of sulphur or the purification of the gas is accomplished in small vessels; thus avoiding the heavy cost of large ground space entailed by the usual massive box purifiers universally employed at gas-works. The process is of particular interest to those who are confronted with sulphur troubles in dealing with coke-oven gas for large gas-engines. Burkheiser's small purifiers would be of great benefit in such cases, even if the SO_2 were turned to waste and unrecovered, on account of their small first cost and the saving in ground-space afforded.

Utilization of Coke-Oven Gas for Town Lighting.

In spite of the big developments in America and Germany which have gone forward in the application of coke-oven gas for

the lighting of townships, very little has been done in the same direction in this country. As long ago as 1901, Dr. Schniewind described well-established coke-oven gas-works at Everett, Hamilton, Camden, and Sparrows Point, in the United States. Other works have followed at Milwaukee and Detroit; and the movement has gone ahead. In Germany at the present time progress in this direction is extremely rapid; and many towns are arranging to take their supply from coke-ovens. An important review on this subject appeared in a recent issue of "The Times Engineering Supplement," pointing out that 212 million cubic feet of gas, of the quality usually supplied to towns, are daily wasted by the coke-ovens of the Ruhr basin, which, at the low price of 7d. per 1000 cubic feet, represents a sum of £2,000,000 per annum. Essen and Mülheim have commenced to utilize this waste by closing down their town-gas works, and relying solely on coke-oven gas; the price of the gas wholesale being 8½d. per 1000 cubic feet. Then Bochum has followed suit by taking the gas from Krupp's Hanover and Hannibal Collieries. Barmen, Velbert, and Heiligenhaus have likewise made contracts for the supply of colliery gas, and many others have made arrangements, or are negotiating to a similar end. In all, about 600 million cubic feet per annum have been already placed,

There have been a few isolated cases in this country where coke-oven gas has been employed for this purpose; but British gas engineers have not yet seriously considered the bye-product coke-oven as a possible aid to their industry. There are many instances where collieries or blast-furnaces possessing coke-oven plant, already provided for as regards their own power requirements, are situated near to large towns; and in these cases the application of coke-oven gas for town lighting might with advantage be carefully looked into. The writer does not suggest that as a gas-making machine the bye-product coke-oven is the equal of the modern gas-retort. The point is that, as a community, we are carbonizing coal for two purposes: (*a*) For the manufacture of town gas, coke being the bye-product; (*b*) for the manufacture of metallurgical coke, gas being the bye-product. From the point of view of the economy of coal supplies, the two processes overlap; so that if the bye-product in either instance, coke or gas respectively, can be substituted, a step towards national economy will result.

During the past generation, the main ambition of the gas industry itself has been to derive from the mother coal the maximum amount of gas obtainable; and to this end gas engineers have devoted themselves to devising retorts which would produce the greatest amount of cracking of the volatile matters. A notable instance of this development is the vertical retort, whereby 12,000 to 12,500 cubic feet of gas are made per ton, compared with 10,000 to 10,500 cubic feet when distilled in the old horizontal retort—a very important movement in conserving our coal supplies. This development has only been made possible by the invention of the incandescent mantle, whereby the thinner gases made under more economical conditions may be made to give out three times the amount of light for a given consumption of gas. The combined effect of the gas industry's progress may be expressed—that the yield has been increased by 20 per cent., and the total gas yield has been turned to three times better account.

As a result of these economies, there has been general revision in the methods by which illuminating gas is now valued; and by the introduction of the "Metropolitan" No. 2 argand burner, a large amount of gas is now available for town lighting, which, before the invention of the incandescent mantle, would not have been admissible. Already some 130 gas authorities have, by the Standard Burner Acts, availed themselves of power to supply gas under the new economic conditions; and the country may now be said to be free from the old candle power superstitions, and in a position to make the most of the coal in the production of lighting gas.

From the point of view of this paper, the progress made by the gas profession has opened up large possibilities for those coke-oven plants, with surplus gas available, which are situated in the neighbourhood of large townships. With the care of a gas manager bestowed on a modern coke-oven installation, there is no difficulty in making town gas of modern standard. I make bold to say that there is no plant which could not either by supplying the whole gas, by fractionation or by enrichment, prove of great financial benefit to an adjacent community. The usual method by which the coke-oven manager disposes of his gas is by burning it under boilers. This is a purpose for which raw coal, without carbonization charges and expensive plant, would be equally suitable. At the colliery, refuse coal would replace the use of gas under the boilers, and the value of the latter fuel for steam-raising would not exceed 0·8d. per 1000 cubic feet. At works to which coal would have to be transported, the steam-raising value of the gas might be double—say, 2d. per 1000 cubic feet. Even if these figures are increased by 50 per cent., the present value is small compared with the cost of town gas into the holder. The average cost of town gas into the holder at sixty gas-works in this kingdom averages 1s. 1d. per 1000 cubic feet, which offers a handsome margin, after deducting the cost of oxide purification (0·5d. per 1000 cubic feet), between burning coke-oven gas under boilers and using it in the town mains. There is ample room for a gain to the coke-oven plant and a substantial reduction to the consumer; and a good deal of overlapping in the matter of coal consumption would cease.

In the above, the writer has mentioned the "fractionation" of coke-oven gas in the consideration of its supply to towns. By this is meant the separation of the richer gases evolved during the earlier stages of carbonization, for dispatch to the town; the poorer gases during the latter stages being retained for oven heating. This was the method employed by Schniewind in the United States at Everett, Mass., and is also employed by some coke-oven gas-works in Germany. In this matter, and in the question of enrichment likewise, the quality of the coal, and the manner in which the carbonization is carried out, determine the course to be adopted. With very lean coals, one or both methods may have to be employed in order to keep up the value of the gas. With richer coals, no fractionation or enrichment is necessary in order to provide gas of present-day standard.

In the case of the Little Hulton Act, with which the writer has been associated throughout, the quality of the whole gas made complies in every particular with the desired standards, and is, in fact, identical in character with the gas supplied in the Metropolis, and made by modern vertical retorts, as will be seen from the following table:

Brackley Gas.	Coal Gas Supplied by One of the Metropolitan Companies.					Gas from Glover-West Vertical Retorts.
CO_2	2·15	1·48	1·75	2·11	2·85	1·00
O_2	0·31	0·25	0·52	1·05	0·20	0·05
Unsaturated hydrocarbons	3·81	3·39	4·73	2·98	3·60	2·85
CO	6·87	8·17	7·18	10·00	7·43	8·70
H_2	49·30	49·21	40·50	48·41	46·66	54·70
CH_4	31·00	31·22	39·50	30 80	31·54	29·05
N_2	6·56	6·27	5·82	4·65	7·66	3·20
Gross calorific value, calories per cub. ft.	144·8	144·5	166·6	145·7	143·4	144·3
Illuminating power by the Metropolitan No. 2 argand burner, at 5 cubic feet per hour	16·0	18·6	18·21	14·48	14·65	15·56

From time to time objections have been launched against coke-oven plant as a source of town supply. Recently, a paper was read by Mr. J. S. Lucking, of Clay Cross, before the Midland Association of Gas Managers,* which pointed to the unreliability of coke-ovens as a source of town illumination. He says that "coke-ovens are not worked so regularly as gas-retorts, and when the ovens are stopped for three or four hours, it is often 36 hours or more before there is any surplus gas." This, no doubt, was the case in this particular instance; but the writer has not experienced any such serious irregularity. The obvious precaution of any coke-oven plant taking upon itself the responsibility of supplying a township is to so duplicate all the running plant that breakdowns and stoppages are reduced to the safety margin provided by gas-works themselves; and this the writer has found neither difficult nor costly, when the advantages of continuous and steady running are considered. Mr. Lucking raises no point against the quality of coke-oven gas, for which he gives the following analysis:

CO_2	0·5 per cent.	
CO	9·0 ,, ,,	
Unsaturated Hydrocarbons	3·0 ,, ,,	Calorific value = 550 B.Th.U. gross. Minimum candle power = 14.
H_2	47·7 ,, ,,	
CH_4	26·2 ,, ,,	
N_2	13·0 ,, ,,	

In view of these considerations, the writer is of opinion that, as regards the supply of gas to towns, there are many instances in which the coke-oven industry may be held to have future prospects. Metallurgical coke, which cannot be made in gas-retorts, has to be produced; and since coke-oven gas now comes within the class of town gases, it may be expected to be no longer a waste bye-product, but of use to metallurgical communities. For instance, if Middlesbrough were supplied with coke-oven gas at 6d. per 1000 cubic feet into the holder, the township would be saved approximately £7000 per annum in manufacturing cost. There are many coke-oven plants that would be glad to dispose of their gas in bulk to townships at the price named.

Utilization of Coke-Oven Gas for Power Development.

The writer has had no personal experience of very large gas-engines running on coke-oven gas, but desires to point to the rapid development in this direction which has taken place in recent years in Germany. It is true that the application of coke-oven gas for this purpose is not so extensive as has been the case with blast-furnace gas; but this is mainly for the reason that coke-oven plants are set down as a rule at collieries, where the domestic need for power is not so great as at iron-works, where often big developments are in progress. The high percentage of hydrogen in coke-oven gas is often alleged as the reason for the non-development of this branch of coke-oven possibility; and it is true that coke-oven gas-engines have to be run on lower compression than is the case with blast-furnace gas. Nevertheless, this drawback has not debarred German engineers from utilizing coke-oven gas wherever expedient. The Augsburg-Nurnberg firm alone has 49 engines, averaging 1290 B.H.P., or a total of 63,270 B.H.P., employing coke-oven gas solely. These engines (representing a capital expenditure of from £350,000 to £400,000) may surely be said to have placed coke-oven gas for engine use beyond the pale of risky experiment. One firm, the Eschweiler Bergwerks Verein, has increased its installation step by step as follows: Two engines

* See "JOURNAL," Vol. CXII., p. 326.

of 520 B.H.P., two of 1110 B.H.P., one of 1160 B.H.P., two of 2330 B.H.P., and two of 2660 B.H.P.—a total for one station of 14,400 B.H.P. This should be sufficient proof of the practicability of coke-oven gas driving.

Messrs. Ernhardt and Sehmer have erected fifteen engines, developing a total of 17,980 B.H.P., all of which are running on coke-oven gas; and at Heinitz, one of their stations, seven engines are at work developing 11,000 B.H.P. At this latter plant, the annual average gas consumption is 0·57 cubic metre per brake-horse-power-hour, the composition of the gas being: CO_2, 2·8 per cent., O_2, 1 per cent., CO, 7·6 per cent., unsaturated hydrocarbons, 3·7 per cent., H_2, 50·3 per cent., CH_4, 24·9 per cent., N_2, 9·7 per cent. On this basis, a modern regenerative coke-oven plant carbonizing 400 tons of coal per day would be capable of developing 5000 B.H.P. Even supposing only a yield of 50 per cent. surplus gas, and 25 cubic feet per brake-horse-power-hour, the total power output would be 3300 B.H.P. for a plant of this size.

The writer believes that a large number of the troubles entailed in the use of coke-oven gas, over and above those dependent on engine design, have lain in the want of thorough preparation of the gas before use. The removal of tars and naphthalene, both of which produce valve troubles, is readily effected by a combination of modern tar-extractors in the first instance, and anthracene washing in the second (the latter being simultaneous with the removal of benzol). The sulphuretted hydrogen which would burn to SO_2, producing corrosion in a heavily water-cooled engine, may be removed either by the usual purifier containing oxide of iron or by Burkheiser's method previously described. Apart from the purification itself, it is of advantage to remove the sulphuretted hydrogen from the gas for the manufacture of the sulphuric acid required by the sulphate of ammonia plant; so that the removal effects a double end. The maximum amount of tar allowed in the gas in German practice is 0·72 gramme per cubic metre, and the total sulphur 0·3 gramme.

Use of Coke-Oven Gas for Furnace Heating.

The employment of coke-oven gas mixed with blast-furnace gas or producer gas for the heating of smelting furnaces is yet in its infancy; but the possibilities in this direction of a large iron and steel plant with bye-product coke-oven batteries as auxiliaries, are not to be denied. If it is assumed that such a plant depends for its power on gas-engine development throughout, it is quite within the bounds of probability that surplus gas will be available from both blast-furnaces and coke-oven plant, which, in the absence of town-gas schemes, would be available for furnace heating. To some extent this is already being done at Kattowitz, in Upper Silesia, where a mixture of coke-oven gas and producer gas has been employed since 1906, with large economies in producer coal; and Krupp's have recently adopted the Kattowitz method.

A mixture of three parts blast-furnace gas and one part average coke-oven gas would pan out as follows: CO_2 9·0 per cent., CO 22·75 per cent., H_2 13·25 per cent., CH_4 7·50 per cent., C_2H_4 0·50 per cent. (C_6H_6 having been removed from the coke-oven gas)—total combustibles, 44·00 per cent.; the calorific value being 206 B.Th.U. Average producer practice would give a gas between the following limits: CO_2 = 3 to 6 per cent., CO = 22 to 28 per cent., H_2 = 9 to 14 per cent., CH_4 = 2 to 3·5 per cent., or a calorific value of from 125 to 175 B.Th.U.—say, from 33 to 44 per cent. total combustibles. The only point in which the composite gas would be lacking would be the tars and soots, which ordinarily pass over with the producer gas into the furnace. The calorific value of the tars is equal approximately to 11 B.Th.U. per cubic foot of gas; thus raising the calorific value of best producer gas to 186 B.Th.U. per cubic foot. This addition, however, does not increase the calorific power of best producer gas to the calorific power of the composite gas given; so that the loss of the tars in the latter are not of moment from a calorific standpoint. It may be objected that the absence of the tars might render the composite gas less luminous and more difficult to control in the furnace; but the writer would point out that washed Mond gas is successfully being used for furnace heating. It is also probable that when the composite gas is highly regenerated, its high content of CH_4, with the small amount of ethylene it contains, would render the flame sufficiently luminous for its easy control.

In mentioning this use for coke-oven gas, the writer is fully alive to its high hydrogen content, and the possible dangers resulting therefrom. Needless to say, that by the employment of such a "composite" as suggested the mixture of coke-oven and furnace gases would have to be carefully regulated and governed. A haphazard mixture would be fatal to its success. The advantages to be derived from following up this use for coke-oven gas are: Substitution of the producers and the cost of working the same, and a gas of constant composition free from steam; the latter being a contingency attendant upon most producers, with a resulting cooling and oxidizing effect upon the furnace. For the rest, given the successful application of this use for coke-oven gas, steel plants would be run on the gaseous surplus from the blast-furnace side, which would result in an economy of 2s. to 3s. per ton of steel. A battery of coke-ovens, carbonizing 400 tons of coal per day, would produce sufficient surplus gas, when mixed with three times its bulk of blast-furnace gas, to replace the ordinary producers required for the manufacture of 1700 tons of steel per week.

After dealing with the utilization of benzol as motor fuel, and the use of bye-product coke in suction producers and stoves, the author referred to the possibilities of bye-product coke-ovens as a solution for the conservation of coal supplies and for the smoke problem. He said: Up to now, few methods have been advanced for the ready combustion of hard-burned coke in household grates, and there has been a tendency towards the production of a soft, low-temperature domestic coke—*e.g.*, coalite—which would be suitable for grates of ordinary design. In the writer's opinion, this movement is retrograde, since it entails the production of large quantities of paraffiny tars, with small yields of gas of very high candle power,

By the inception of the incandescent mantle, the need for a high candle gas is no longer of moment, and a large quantity of gas, in view of its application for power and lighting purposes, is of more value to the country as a whole than a great quantity of tars. Making due allowance for our requirements of tar derivatives for the textile industry, medicinal products, antiseptics, road treatment, &c., the aim of all carbonization processes should be to obtain as much gas from as little coal as possible; and since this entails (by the high temperatures necessary for such gas production) the manufacture of a hard coke, we must seek some means of utilizing the latter, and more economically produced, fuel for every possible purpose. This is not so insuperable as the tendency towards coalite production would have us believe. It is true that closed stoves would have to be employed, and central heating, or a composite gas and coke fire might be essential; but all of these are worth the trouble in the consideration of coal economy. The change may not come about until, as a race, we decide to abolish the blazing coal-fire; but that time is bound to come, although legislation may be the last resort. When this new era in coal economy arrives, and all coal has to pass through a carbonization stage, the bye-product coking process will lay still further claims to national utility.

Discussion.

The following facts were brought out in the course of the discussion to which the paper gave rise.

The President (Mr. T. C. Hutchinson) remarked that Mr. Bury's paper might be fairly regarded as a sequel to two of the papers which had been given during the present session before the Institution. Professor Bone had given a lecture on the theory of combustion; while at the last meeting Mr. Sherwood-Hunter contributed much valuable information about separating impurities from coal, and also about drying it. Now Mr. Bury had followed with the bye-product coking process and its future development. The paper just read was a suggestive and valuable one. The Skinningrove Company were making experiments as to the mixing of coke-oven gas with their blast-furnace gas.

Mr. Greville Jones said there were several places in England where gas-engines were working with coke-oven gas. With respect to the consumption of coke instead of anthracite, many persons had taken up the use of anthracite stoves in their houses, much to the improvement of the air. He had attended a meeting of the Society of Arts at which photos of the atmosphere of London at 4 a.m. and again at 8 a.m. were shown; and the purity of the atmosphere at 4 a.m. was wonderfully good compared with that four hours later.

Mr. C. H. Ridsdale remarked that he did not know whether, in speaking of three parts of blast-furnace gas and one part of coke-oven gas, the writer meant this by volume or by weight. Of course, the gases did not thoroughly and evenly mix. Much depended on the pressures.

Mr. Elioate said the Simon-Carves Company were building ovens for the direct recovery of bye-products; and the gases from coke-ovens were utilized for power purposes at the Wharncliffe Silkstone Collieries and elsewhere. As to the value of benzol as a substitute for petrol for motor vehicles, tests made in a 3000-mile trial—150 miles per day for twenty days—showed that benzol gave 20 per cent. more power than petrol.

Mr. Coulson expressed the belief that there were great possibilities with respect to town lighting by coke-oven gas.

Mr. Bowen thought the manufacturers of patent oven coke had in the past been too keen to recover the bye-products; and the quality of the coke had suffered.

Mr. H. Stonewall Jackson said they were not so far behind in England in the utilization of bye-product gas for power purposes. It was employed at Bargoed collieries, at Cargo Fleet, and at the Silkstone collieries.

Mr. Hutchinson pointed out that he had visited a works where coke-oven gas and blast-furnace gas were being mixed; and the manager stated that he was perfectly indifferent about the proportions used. It did not matter at all. If the blast-furnace gas was short, he put on more coke-oven gas, and *vice versâ*.

Mr. H. W. Jarvis remarked that he was glad to hear something was being done in Great Britain in the way of utilizing gas from coke-ovens. Germany had hitherto led the way.

Mr. Bury briefly replied to the various points that had been raised in the discussion.

In the "Journal" last week some particulars were given in regard to the will of Sir John Aird, Bart., which had been provisionally proved at £1,100,000. The duties on the property will amount to upwards of £175,000. Sir John Aird's is the eleventh millionaire estate upon which duty has been levied during the financial year which ends on the 31st inst. This is the largest number of estates of the kind recorded in any year except 1906, when death duties were levied on thirteen such estates.

COKE-OVEN GAS FOR TOWN SUPPLY.

The following are some particulars from a lengthy article on "Gas Supply over Long Distances in the Rhenish-Westphalian Industrial District" which appeared in a recent issue of the "Frankfurter Zeitung."

Three important schemes for the supply of light and power have been brought near completion in the industrial centre of Rhineland and Westphalia during the last three years closely connected with the names of Stinnes and Thyssen. By the first scheme, the lower Rhine and Westphalia are to be supplied with electricity from a central station, and under uniform conditions and management. The second endeavours to unite the enormous, but complicated, net of small railways in this district under a common administration. The third will centralize and monopolize the gas supply of the district, and thereby do away with the numerous municipal and private gas-works.

The first project has been greatly advanced during the last ten years. Less has been heard of the centralizing of tramways, though things were progressing in this direction. The third plan—the supply of townships and villages with gas from the coal mines of the Ruhr district, and the incidental shutting-down of the municipal gas-works—is at the moment a subject of heated discussion. The object is to collect the many million cubic feet of gas which at present escape, either unused or only partially used, during the process of coking coal in mines, and send it over long distances into the gasholders of the towns, to be distributed in the district mains. The available quantity of gas to-day at the Ruhr coal mines waiting for a useful employment is estimated at 5 million cubic metres (175 million cubic feet), of an annual value of 30 to 40 million marks (£1,500,000 to £2,000,000).

These immense values should no longer be lost, or merely used as fuel and heating material. In America, these values have for a long time been made use of for the gas supply of towns; and there pipe-lines are in existence covering several hundred kilometres, while here lines of, at the utmost, 60 to 70 kilometres are the maximum, and in most cases distances of 2 to 3 kilometres (Essen) are in question. The problem has not as yet assumed a commercial form. The Rhenish Westphalian Electricity Works are propounding the scheme, and are acting as agents or promoters for the coal mines, until the promotion of the Rhenish Westphalian Gas Company is completed, with a view to a mutual understanding between the two Companies.

At first sight, the problem for towns and villages seems, from a financial point of view, very simple. The Rhenish Westphalian Gas Company supply gas into the holders of the towns at the price of 3·5 pfg. per cubic metre (1s. per 1000 cubic feet).* This is an offer to the Municipality of Düsseldorf. The town owns the distributing mains, and therefore requires only a distributing staff for the control and maintenance of the district and for the accountants' department, whereby the cost price of 3·5 pfg. is raised to a selling price of 13 to 15 pfg. (3s. 9d. to 4s. 3d.). The greater part of the staff and the small army of workmen will no longer be required; and the difference between the cost and selling price, less the cost of management, small depreciation, and interest for the existing gas-works, will represent an enormous profit.

Let us take a large town consuming 30 million cubic metres (1059 million cubic feet); and assuming the net cost to the municipality to be 3·5 + 2 = 5·5 pfg. (1s. 6d.), the profit on 30 million cubic metres, at the rate of 7·5 to 10 pfg. (2s. 2d. to 2s. 10d.), will be 2·25 to 3 million marks (£112,500 to £150,000). At least, this is the way the layman will look at the problem, bearing in mind Messrs. Stinnes' price of 3·5 pfg., and the consumers' price of 13 to 15 pfg. But the municipal gas managers calculate in a different way. They maintain that a price of 3·5 pfg. into the holder is higher than their own manufacturing costs, which would amount to a loss for the municipality. In one case, the following calculation was made: Added to Messrs. Stinnes' price of 3·5 pfg. is the maintenance of the existing plant at 0·679 pfg., and for interest and depreciation to the meter 0·926 pfg. (0·236s.). Therefore the cost of Messrs. Stinnes' gas at the meter is 5·105 pfg. (1s. 5d.). The present cost of production, into the holder, is, including the above-mentioned costs of maintenance and interest, 3·563 + 0·926 = 4·489 pfg. (1s. 3d.), and is therefore lower than Messrs. Stinnes' price. But if we should decide to erect an up-to-date works, with the best available plant, we could come down to an inclusive cost of 3·622 pfg. (1·03s.); and if continuing in the existing works, and substituting an up-to-date carbonizing plant with vertical retorts or chambers, the cost would be 3·829 pfg. (1s. 10d.). In any of these three cases, we are, with our own works, in a better position than when accepting Messrs. Stinnes' offer. This offer could only be acceptable at or below a price of 2·5 pfg. (9d.).

But another most important point has to be considered. In the drafts of agreement submitted by the Rhenish Westphalian Electricity Works to the municipalities, it is stipulated that, in case of strikes, the town will be indemnified with 10 pfg. (2s. 10d. per 1000 cubic feet) for every cubic metre not supplied. Municipal engineers are of opinion that this would not represent a reasonable equivalent to the enormous damage done if a town should be without gas for a period of only one or two weeks, since even for a shortage of 5 million cubic metres (175 million cubic feet), the compensation would only be 500,000 marks (£25,000). They therefore think that the water-gas plants provided for such a contingency would have to be erected in the various towns, and not at the mines. This being so, the cost price to the mines would be reduced by another 0·6 pfg. (0·17s.); and this, deducted from 3·5 pfg., would only leave a small margin over and above the municipal offer of 2·5 pfg. The engineers further calculate that the cost into the holders, with a main of 400 mm. diameter, can only be 1·389 pfg. (0·39s.), and that the mines would, even at the selling price of 2·5 pfg., make a very handsome profit, considering the enormous quantity to be sold.

These calculations by gas engineers are, of course, vigorously combated by the Rhenish Westphalian Electricity-Works. On the face of it, it seems to be surprising that all of a sudden municipal gas engineers say that they can produce gas so cheaply, and that the enormous difference between their cost of production of 4·489 pfg. (1s. 4d.) and the consumers' price of 13 to 15 pfg. (3s. 9d. to 4s. 3d.) should be nearly all wasted by distribution. It has, of course, to be considered that in most cases the gas-works also have the burden of public lighting; but even then the difference seems incomprehensible.

In the meantime, a report by the Manager of the Municipal gas-works in Remscheid (Herr Borchardt) has been published, in which it is stated that the offer of the Rhenish Westphalian Electricity-Works for the town of Remscheid, with an annual production of about 5 million cubic metres (175 million cubic feet) was advantageous, and the conclusion of the contract was to be recommended. Herr Borchardt calculates for the town that "the total cost for the production of gas in the Municipal works at Remscheid is very low, and, including interest and depreciation, amounts to 5·38 pfg. (1s. 6d.) per cubic metre." On the other hand, the works of a large town in Rhineland with more than 30 million cubic metres (1059 million cubic feet) production claim a cost of production of 4·49 pfg. (1s. 3d.). Part of this difference in price is easily explained by the great difference in volume of production. Though the price of coal showed a difference in Remscheid of 14·5 marks against 13·95 marks in 1909, this does not explain the difference in the calculation of cost.

A point in favour of the Rhenish Westphalian Electricity-Works is that, with higher prices of coal, the cost of the Municipal gas-works would be higher, while the mines, using their own coal, would be less affected by this. At all events, it seems to be clear, on studying the calculations of both parties, that it will be only the fraction of 1 pfg. per cubic metre which will decide for or against the conclusion of an agreement which, of course, will amount, in the case of a town of 30 million cubic metres production, to 300,000 marks (£15,000).

Apart from the financial considerations, the question is, of course, also of importance as one of municipal politics. The towns are to give up the production of gas for reasons of economy, and to limit themselves in future to its distribution. Though the financial advantage would thereby not be theirs, but largely that of the mines, the mines will reap large profits in usefully employing the gas at present escaping into the air. For a slight advantage, the towns will lose their independence, which might be, in certain cases, a very serious factor, and might also be a point in favour of erecting water-gas plant in the towns and not at the mines.

The first town to conclude an agreement with a mining company for its gas supply was Essen, which buys from Messrs. Stinnes' mines situated within its boundaries unpurified gas at a price of 2·5 pfg. (1s.). The town of Essen also undertook to have a water-gas plant ready in case of strikes. Mülheim-on-the-Ruhr made a similar agreement with Messrs. Thyssen and Stinnes. Gelsenkirchen has been buying coke-oven gas since early in 1910 from the Rheinelbe mine of the Gelsenkirchen Mining Company. At last year's meeting of the Association of Gas and Water Engineers, the Manager of the Gelsenkirchen Gas-Works spoke very favourably of his experience in this direction. Soon after, Bochum made an agreement with the Krupp Works for the supply of gas from the Hanover and Hannibal pits. Finally Barmen has, for the last three months, been supplied with coke-oven gas from Messrs. Thyssen. The scheme put forward undertakes to supply gas under combined management to the Municipalities of Gevelsberg, Milspe, and Schwelm, and to the towns of Barmen and Elberfeld, Lüttringhausen, Remscheid, Solingen, Hilden, Ohligs, and Benrath, which would be the end of the line. This would, therefore, amount to a voluntary combination of the towns for a combined gas supply. Another scheme is for the supply by a common main of the towns of Krefeld, on the left bank of the Rhine, and Düsseldorf, on the right bank. These two towns are to be supplied from Messrs. Haniels' pit, situated on the left bank of the Rhine near Moers; while all the other towns would be supplied from the Ruhr district.

The following are the most important points in the agreement submitted to the Municipalities:—

The transmission of gas into the holder free of charge.

The coal gas must be supplied continuously, and in perfectly purified condition, and must at any time comply with the requirements of modern gas practice.

The following special points must be complied with.

A.—The gas must be well cooled and practically free from tar and sulphuretted hydrogen.

B.—The gas must not contain more than 2 grammes of ammonia or 45 grammes of naphthalene in 100 cubic metres.

C.—The lowest limit of the gross calorific value must be

* In subsequent similar instances, the figures in brackets are given, as here, in shillings and pence per 1000 cubic feet.

5200 calories at 0° and 760 mm. barometer, on an annual average; and it must at no time fall below 5000 calories.

The agreement lasts for 25 years. Streets and thoroughfares must be at disposal for the laying of mains.

The Municipalities have the right to decide the position of the mains.

The Municipalities agree to the following prices per cubic metre of gas supplied.

Under	2	million	cb.m.	annually,	at	3·7	pfg.	per	cubic metre.
,,	3	,,	,,	,,	,,	3·6	,,	,,	,,
,,	4	,,	,,	,,	,,	3·5	,,	,,	,,
,,	5	,,	,,	,,	,,	3·4	,,	,,	,,
Over	5	,,	,,	,,	,,	3·3	,,	,,	,,

This is equivalent to—

Under	70	million	c. ft.	annually,	at	1·05s.	per	1000	cubic feet.
,,	105	,,	,,	,,	,,	1·02s.	,,	,,	,,
,,	140	,,	,,	,,	,,	1·00s.	,,	,,	,,
,,	175	,,	,,	,,	,,	0·97s.	,,	,,	,,
Over	175	,,	,,	,,	,,	0·94s.	,,	,,	,,

Should the Rhenish Westphalian Electricity-Works concede a more favourable scale of prices to another municipality in the district, the same reduction will take place with the Municipalities named.

The Rhenish Westphalian Electricity-Works agree to supply the necessary gas continuously. Fire, war, &c., strikes excepted, will free them from their obligations to supply, at the ratio, and for the duration of the disturbance.

The Rhenish Westphalian Electricity-Works agree to supply the gas also during a general miners' strike.

The increased cost thereby entailed is shared by the Municipalities to the extent of 1·5 pfg. per cubic metre of gas supplied during this time.

Should the Rhenish Westphalian Electricity-Works stop the delivery of gas entirely or partially, the Municipalities may claim compensation of 10 pfg. per cubic metre for every cubic metre of gas not supplied.

That every municipality will seriously consider the conclusion of this agreement, goes without saying, for, besides the monetary considerations, a good many factors must be borne in mind.

The municipality give up their independence in an important direction, although they gain an influence in the administration of the Rhenish Westphalian Electricity-Works according to their financial participation. But the idea is a healthy one from the point of view of political economy, which, with suitably-drafted agreements, and provided the municipalities exercise the necessary care and judgment, should be capable of being applied to the advantage, not only of the mines, but also of the municipalities.

HIGH-PRESSURE TRANSMISSION OF GAS.

Two American Installations.

The subject of the transmission of gas under high pressure is dealt with in an illustrated article in "Progressive Age," of New York, for the 15th inst., which has recently come to hand.

The writer begins by pointing out that during the past few years the apparatus for manufacturing and purifying gas has been greatly improved, and the many bye-products obtained have found ready sale and wide demand. To economically prepare these in marketable shape requires plant capable of comparatively large production; so that the tendency now is to centralize the point of manufacture for several neighbouring communities and thus obtain the benefits resulting from the disposal of the bye-products. This idea of a central plant supplying a considerable area naturally implies the necessity of many miles of piping, which, applied to the ordinary low-pressure system of gas distribution, with its large, heavy pipes, means a considerable outlay of capital. With the high-pressure system of gas transmission, however, these drawbacks are avoided, and many additional advantages are to be obtained. To illustrate the simplicity of the high-pressure system for all classes of service, the writer describes the methods used in the case of two gas plants operating under widely different conditions, where gas is supplied either partly or altogether by the system, and Westinghouse steam-driven compressors are used.

An Eastern municipal gas and electric light plant supplies three neighbouring towns. It is situated in the central part of one town, and is from three to four miles from the others. The whole town where the plant is situated is supplied with low-pressure gas, flowing directly from the holder through large mains at a pressure of 2½ inches of water. The other towns are supplied through high-pressure mains; the gas being drawn from the holder by the compressor, and delivered directly into the mains. In each house supplied by these mains there is a Reynolds governing valve, which automatically reduces the pressure to the house-service pressure. Some 15 miles of 2-inch pipe is already laid in a territory of about four miles radius covered by the high-pressure system. The difference in cost of placing 2-inch wrought-iron pipe for this distance, instead of a large cast-iron pipe such as would be required for low pressure, will be sufficient to buy and operate a compressor for many years.

The gas-compressing outfit in this plant consists of two Westinghouse 9½ inch by 13 inch by 10 inch water-jacketed compressors, mounted on the wall of the engine-rooms. The steam-pressure varies from 60 lbs. to 100 lbs. at different times during the day. Only one compressor is used at a time. The low pressure is very constant; being almost exactly 2½ inches all the time. The high pressure varies from 10 lbs. to 14 lbs., being lowest in the daytime when the steam pressure is low. The average quantity of gas delivered during the daytime appears to be from 10 to 12 cubic feet per minute; running up to about 25 cubic feet in the late afternoon, at the time when gas is required for both lighting and cooking. The management of the gas-works is perfectly satisfied with the compressor operation.

A plant situated in Eastern Pennsylvania supplies gas to the town in which it is located, and also to two other towns 3½ miles and 3 miles distant respectively. All three towns are supplied by high-pressure mains; a reducing governor being placed at each house. The principal high-pressure mains are 3 inches, and the city street mains 1¼ inches in diameter; reducing at the branches to the houses to 1 inch or ¾ inch as required. No low-pressure gas is supplied direct from the plant. The system used at this plant is different from that previously described, in that the compressor is operated only four times daily, raising the pressure to from 10 lbs. to 25 lbs., then stopped, and the pressure in the main allowed to fall gradually.

The plant consists of a horizontal tubular boiler, rated at 20 H.P.; a gas-producing plant, rated at 6000 cubic feet per hour; a gasholder about 32 feet in diameter, and capable of holding one day's supply of gas (6000 cubic feet); and a Westinghouse 11 in. by 5 in. by 12 in. compressor, installed on the wall in a corner of the boiler and producer room. The pressure in the gasholder is uniformly 2⅞ inches of water. In the mornings, about seven o'clock, the compressor is started, and the pressure in the mains is raised to from 8 lbs. to 12 lbs.; then the compressor is stopped. The gas-producing apparatus is started, and the pressure in the mains raised as above, and the compressor stopped. The gas-producing apparatus is then started, and enough gas for the whole 24 hours made—this occupying about two hours. At noon the compressor is started again, and the high pressure is raised to from 10 lbs. to 12 lbs. Between five and six in the afternoon, the compressor is started, and it raises the pressure in the high-pressure mains to 24 lbs. This last operation is repeated again between nine and ten o'clock in the evening. There are about ten miles of high-pressure pipe in the system; and the parties find this volume raised to 24 lbs. at this time (ten o'clock) will last through the night until the compressor is started in the morning. The steam pressure used is from 65 lbs. to 75 lbs. The gas company express themselves as being well pleased with the operation of the outfit.

While the plants which have just been described use only steam-driven compressors, there are certain conditions where motor-driven compressors can be employed to advantage, either for the complete installation or in conjunction with a steam plant. For example, a certain high-pressure gas-transmission installation consists of two 9½-inch steam-driven compressors (one being a reserve unit) and a motor-driven compressor; the latter being equipped with a very efficient and reliable governing device, so that during the night the steam plant could be shut down and the motor-driven compressor left to operate automatically without the attention of anyone except the night watchman.

The most novel feature of this installation is the governing device. The switch portion of the governor is located outside the building, in a suitable weather-proof box, to avoid possible danger from sparking. This switch portion is similar to that of the standard electric pump governor, except that the piston is larger, and provided with a special packing leather, &c., to adapt it for use with the low-pressures used. The regulating panel, which is placed indoors, consists of a U-tube mercury column, having suitable contacts, permitting of close, accurate, and constant adjustment. High-pressure gas is admitted to, or discharged from, the switch portion of the governor, according to variations of gas pressure determined by the setting of the contacts by means of magnet valves connected to the contacts of the regulating panel, and operated by a supplementary dry battery. This apparatus is stated to work most satisfactory; and it is capable of being adapted to any class of high-pressure gas-transmission work. Where a direct-current machine is required, it is usually best to instal it out of doors, to avoid any danger of gas igniting from a sparking commutator; and the compressors are accordingly designed for outdoor service.

The writer states that the use of Westinghouse compressors in this service has invariably met with unqualified success. Their simplicity, ease of installation, reliability, durability, low cost of maintenance, and little need of attention, make them specially adaptable to such service. They are connected so as to draw the low-pressure gas directly from the gasholder, compress it, and deliver it through a suitable storage reservoir into the high-pressure mains. For cases where the high pressure is required to be constant during the 24 hours, an automatic governor is applied to the compressor, which regulates its speed so as to maintain the desired high pressure practically constant. These governors may be easily regulated for any pressure required. For cases where the high pressure is raised to a certain maximum, and allowed to expand until a fixed minimum is reached, a governor is furnished, when specified, which will stop and start the compressor for any desired range of pressures required.

In all cases where a recording pressure gauge is used to register

the high pressure, or an automatic governor employed to control that pressure, the use of a large storage reservoir in the high-pressure main, not far from the discharge of the compressor, is found to sufficiently improve the operation of both governor and recording gauge to warrant the expense of its installation. It also usually prevents condensation of moisture in the main, as this generally precipitates in the reservoir, where it can easily be drawn off. Consequently, such reservoir should be placed at a low point in the main, should be in a cool place, and should have a suitable drain connection. All governor and gauge connections should be made to this reservoir, not to the high-pressure main.

DEVELOPMENTS IN GAS MAKING.

Mr. Samuel Glover's Paper to the Liverpool Engineering Society.

At the Meeting of the Liverpool Engineering Society last Wednesday—the PRESIDENT (Mr. Edward Allen, M.Inst.C.E.) in the chair—a paper on the above-named subject was read by Mr. SAMUEL GLOVER, M.Inst.C.E., of St. Helens. It was fully illustrated by diagrams and lantern views of the various kinds of plant described, with most of which "JOURNAL" readers are familiar. The following is an abstract of the paper.

The author explained at the outset that he decided upon the title of his paper with a view to restricting the scope of it to that part of the general subject of gas engineering which is included in the work of the retort-house, and has direct bearing upon the work of placing the coals within the retorting chamber or still in which the work of destructive distillation is carried on; and that it was not intended to deal with the other branches of gas making, included in the operations of condensation, purification, testing, storage, and distribution. For the purpose of setting forth the essential features of the simplest form of gas-works, the author exhibited a sectional diagram of gas-making plant; showing a horizontal retort set over its furnace, the retort being fitted with its gas take-off pipe dipping into a seal in the collecting main fixed on the top of the setting. It was seen how the gas is conveyed to an atmospheric condenser, thence to the washing and purifying plant, and finally to the gasholder.

In order to enable developments to be appreciated, it was necessary, Mr. Glover said, to look at the condition of things in its early stages of gas manufacture, the credit for the introduction of which could very properly be claimed by William Murdoch. In the present days of iron and steel, chemical apparatus, and highly developed technical knowledge, it was not easy to realize the difficulties which confronted the gifted men who wrought at and worked out the engineering problems which were tackled and mastered, to some extent, in the latter part of the eighteenth century. When gas lighting was first brought out, progress depended upon the work of men gifted by Nature with latent powers. Murdoch was a man of this kind; and when he had conceived the idea of making gas lighting of practical application, he and others whom he influenced tested retorts of various materials and shapes and of ever-growing size. As the importance of their discoveries became evident to them, all sorts of substances were tried for the purposes of ascertaining which was the best for making gas of good illuminating power and capable of being the most easily purified. Not only had they to do this, but when it was done they had to see to the making of suitable pipes, purifiers, holders, &c. The author said he had had the advantage of seeing at the Soho Works of Boulton and Watt some of the first practical gas apparatus put together by Murdoch and his immediate followers, including one of the first holders, which was to be seen at work up to a short time ago.

Mr. Glover showed the various forms of retort used by Murdoch. The first differed very little in shape and setting from a cast-iron domestic washing boiler; but as it offered no facilities for the removal of the coke after the carbonization of the coal, he was led in 1802 to adopt a horizontal form of retort, which, while not being so easy to charge (the coal having to be thrown into the retort in as level a layer as possible), had a mouthpiece of full size, and allowed the coke to be withdrawn by means of a rake. Two years later, he went back to a pot-still form of retort, having provided this with a large lid for easy charging, a branch at the bottom suitable for removing the coke, and the necessary outlet near the top for the products of distillation to pass over. Not being content with any of these forms, he experimented in 1805 with an inclined retort. All these retorts were made of cast iron, and were heated by means of a very simple form of direct-fired furnace. The horizontal system, however, was the one universally adopted as gas making became an established practical process. This was shown by the reproduction of an engraving from the "British Cyclopædia," published in 1833, in connection with an article on "Gas Manufacture."

The author remarked that for many years the gas industry lay under the charge of making no progress in the way of introducing new processes of carbonization; for though fire-clay retorts were introduced in lieu of cast-iron ones, and many different methods of putting varying numbers of them in one arch or chamber, up to about the year 1885 all were set horizontally. One exception to this rule, however, was mentioned. A Scottish gas engineer of the name of Scott, who was well known to a co-worker of the author, tried about fifty years ago a system of carbonizing coals in a retort set vertically with a hopper charging arrangement closed by a bell-shaped valve, with a mechanical discharging device for the removal of the coke, and a gas take-off branching out of the retort. This system was not, however, perfected, and left the dream of aspiring gas engineers for a vertical system to be realized at a later date.*

Mr. Glover next passed on to deal with the efforts made by gas engineers to supersede the old methods of working horizontal retorts charged by means of a shovel and emptied by a hand rake. Many effective mechanical appliances had, he said, been developed; a very early worker in this direction about forty years ago being "one of the gas industry's honoured veterans, Mr. John West, M.Inst.C.E." Mechanical appliances had gradually, particularly during the last twenty-five years, been adapted to the largest settings of horizontal retorts. The aim of all charging-machines was to lay the charge of coal as evenly as possible. It remained, however, for M. Andre Coze, of Rheims, to be the first to arrange a number of inclined retorts in one setting, and feed them from overhead hoppers fixed above the upper ends of the retorts, and connected during the charging operations by means of movable shoots. The next step in the development of gas-making machinery was the outcome of a long series of experiments made by M. de Brouwer, of Bruges, whose inventions had, Mr. Glover said, "done much to stimulate advances in the adaptation of engineering appliances to the work of moving the great mass of material now required in many gas-works." The leading idea of the De Brouwer charging-machine was the outcome of a wish to prove that projection and not conveyance was the desirable method of introducing coal into horizontal retorts. The first decade of the twentieth century had witnessed the increasing use of electrically driven machinery; and modern gas-works now often had included in their design a power-house where gas-engine driven dynamos generate electrical power, which is afterwards distributed about the works, including the retort-house, where power motors are installed to do the work of driving the machinery as he was about to describe, as well as many other of the mechanical appliances used in modern gas-works.

The author described in detail the machine just referred to, and then went on to say that the next important step in connection with the working of horizontal retorts was the introduction of the Fiddes-Aldridge machine, the aim of which was to effect simultaneously the discharge of the coke from a retort and the deposit therein of a new charge of coal. He pointed out, however, that these systems required that the coke should leave the retort while still in its glowing condition, and consequently requiring to be slaked by water poured on to it, with the inevitable production of large volumes of steam, and the utter loss of all the heat carried away by the steam. The possibility of utilizing this heat in the process of gas making was a subject upon which the old men of the gas profession have "dreamed dreams" and the young men had "seen visions." Moreover, it appeared to some that the forces of Nature were not being so largely used as they ought to be in conducting the operations of charging and discharging. These and other considerations had led to the development of a process which was considered by many experienced engineers to be destined to take a very helpful part in the doing of the work of future carbonizing engineers. While requiring less labour, causing less nuisance, making fewer demands for the application of forces to keep it working, it conserved the heat energy, and generally caused less wear and tear of the apparatus. This process was the continuous carbonization of coals in vertical retorts. The aims of those who had worked out the simplest application of this process were: To save ground space, simplify the operations and reduce wear and tear, increase the output per retort and the output per ton, improve the working conditions of retort operators by making more extensive use of Nature's laws, avoid as far as possible dust, smoke, and steam being evolved into the atmosphere, get more efficiency out of the fuel used in heating the retorts, prevent loss of heat by avoiding the discharging of glowing hot coke from the retorts, avoid the necessity of saturating the coke with water, and secure, along with these advantages, that the gas made shall be of regular quality and of good calorific and lighting value. The apparatus (the Glover-West vertical retort setting) by means of which the objects of the inventors have been attained was shown and described.

In conclusion, the author said that in the opinion of many experienced engineers who had during the past two-and-a-half years visited the works of which he has charge, where the first installation of the system of vertical retorts he had described had during this time been continuously at work, the process was "the most striking and successful development yet introduced into this branch of engineering."

Discussion.

The PRESIDENT, in moving a vote of thanks to the author, said he thought that while the earlier portions of the paper were very interesting as a record of historical facts in connection with gas making, the end had come too soon; and he would have been glad to have had more information with regard to the latest carbonizing plants. His disappointment had, however, been somewhat mollified by the exhibition of the lantern slides and the explanatory remarks thereon, in which some of the latest plants were shown. They had had the advantage of listening

* The system referred to was described and illustrated in the "JOURNAL," Vol. XXIV., p. 93; and the description is reproduced in "King's Treatise on Coal Gas," Vol. I., p. 236.

to a man who had spoken the last word about carbonizing machinery—in the Glover-West vertical retort—though, looking to the great activity that had been going on in this branch of gas engineering, he did not think that it was the end. There was no doubt as to the great advantage of the continuous process. In the ordinary intermittent system, coal was put into the retort which had been made very hot, but which was cooled by contact with the mass of coal. It was closed up, and for the first hour or two the conditions were not satisfactory. The retort became somewhat cooled; the gas was not so permanent as it should be; and then there was a space of time when the proper conditions of carbonizing were fulfilled. But too much heat was generated, and the period was arrived at when the charge was withdrawn, and the intermittent process was begun over again. In the case of the continuous system, less fuel was required, and gas of uniform quality in regard to illuminating power and calorific value was obtained. One advantage of the use of the vertical retort was that the coke did not require any quenching. He was satisfied that coke ought not to be quenched with water. To pour water on to red-hot coke was to do harm to it. The coke was broken up, a lot of water was left in which interfered with the value of the coke, and a large amount of heat was wasted. In the Glover-West retort, the coke was brought to the bottom chamber, was then cooled by the secondary air passing round it, the benefit of the heat was obtained in the secondary air, and the coke was at such a temperature that it might be handled quite easily. The excellent condition of the retorts which had been working at St. Helens for more than two years was a matter for congratulation to the patentees.

Mr. J. H. Crowther (Wallasey) thought that from some of the author's remarks it would appear to the outsider that very little progress had been made in gas engineering. The general principles had certainly not altered very much; and until the time of regenerative firing was reached, very little progress was made. He had been somewhat surprised that no mention had been made of Mr. Friederich Siemens and the useful work he had done. He would not have to class himself in future as an "intelligent gas engineer;" and he was not exactly sorry, particularly with reference to retort-stoking machinery. A great deal was heard in the early stages about the advantages of machinery over hand work; but when one came to look at the balance-sheets and at the selling price of the gas, these advantages were not always apparent. He did not wish it to be understood that he was averse to the use of machinery generally. The *crux* of the paper appeared to be in regard to vertical retorts. He had seen them in operation and had been very favourably impressed with their working, and especially with the fact that there was the least possible machinery—nothing but the elevator—in the retort. There was ample time for repairs to be made without inconvenience to the working of the retort-house; whereas with a lot of machinery there was no time to repair, and it was necessary to do something in the way of makeshifts. The question of utilizing the heat from the coke was a very important one. The only objection to it, so far as he could see, was that they drew out cold coke, and when they came to feed their producer there was a certain loss compared with incandescent fuel. The author had given some figures as to the amount of coke used in vertical retorts. He (Mr. Crowther) had some Siemens furnaces where the waste gas was taken back; and they could beat the figures given for the verticals. One of the great features of the vertical compared with the inclined retort was the unvarying quality of the gas. It was well known how difficult it was to keep the quality constant; and, in his opinion, it was a more important matter to the consumer to have this than to have gas of irregular quality. He took it that the vertical retorts were not suitable for working with cannel. With horizontals, however, it was possible to charge one or two of the retorts with cannel, and so level matters pretty fairly.

Mr. R. E. Gibson (Liverpool) said that in the opinion of gas engineers throughout the country the vertical retort was the carbonizing system of the future; and it appeared to him that its leading claim was its continuous working, as this resulted in advantages which were not obtained when working intermittently. Another great point was the conservation of the heat. This was important, and resulted in the saving of fuel and in the production of coke without the addition of water in quenching. In regard to the reduction of labour costs, this was one of the claims put forward for machinery; and no doubt it could be substantiated. But when one took into account the interest on capital and depreciation in addition to the labour charges, he did not think there could be very much difference between the horizontal system worked with machinery and the vertical system which had been put before the meeting. There were one or two things that might be said against the system, though perhaps they were not very important. As regards the question of inspection and repair, the vertical position of the retort was much more difficult to deal with than the horizontal one. Then the coal required to be elevated to a much greater height with verticals than with horizontals; and this meant that more power was required. It would also appear that stronger stays were necessary owing to the increased height. He should be glad to have Mr. Glover's opinion as to the life of vertical retorts, though probably it was too soon to form a reliable opinion on this matter.

Mr. Arthur Marks, referring to the effect of the vertical retort on the products, said that in dealing with the carbonizing question one had to work from the point of view of either coke or gas. If working for gas, a different method was adopted from that employed in working for coke. In this connection it was interesting to note the opposite directions in which the development had taken place in the two processes. In the manufacture of coke, the vertical oven had died out; it was practically a larger type of Glover retort. It would be interesting to know the nature of the experiments which had been conducted with regard to the value of the residual products. In the case of coke, where it was used for domestic purposes the presence of impurities was not of great moment; but in the case of gas making, where the coke was not being made use of, the reproductive effect was an advantage. As to the composition of the gas, uniformity was obtained by continuity in production; but the position of the take-off was going to influence the composition of the gas. With respect to the temperature at which the gas left the retort, as it passed up through the coal they were practically introducing an action similar to that of the water-gas producer, where oil was used for increasing the illuminating power of the gas; and it ought to be possible to get a high quality of gas with the Glover-West retort by adjusting the height of the take-off. He was not aware of the temperature at which oil was introduced into water-gas plant. The position of the take-off was evidently considered by Scott in the retort of his referred to in the paper, though probably, as an engineer, he was not so concerned as a chemist would be with the products found in the gas.

Mr. Ginman said he should be glad to have Mr. Glover's opinion as to the suitability of his system for small works. He would be interested to know how the fuel efficiency compared with that of smaller units, as it would not be so great in these. He congratulated the author in doing away with the hydraulic main and seal, as in this lay much of the improvement in the calorific value and illuminating power of the gas produced. He had in mind an installation of horizontal retorts with hand stoking, making about 2 million cubic feet per day, where 100 men were required. There was, of course, a limit to the number of men who could be employed; and in large works this justified the adoption of labour-saving machinery, because this class of labour was not too easily obtained. He should like to have Mr. Glover's opinion as to the number of hands that would be required, from dealing with the coal in the waggons to stacking the coke in the yard, for 2 million cubic feet per day with the vertical system.

Mr. J. Walwyn White remarked that it was interesting to note that while Mr. Glover had succeeded so well with vertical retorts, all the latest coke-oven plants installed in collieries in this country were of the horizontal type.

Mr. Glover, in reply, thanked the meeting for the kind manner in which his paper had been received. Referring to the President's remarks, he said he had certainly not put the paper forward as the last word in regard to carbonizing plant. He did claim for the sloping retort that it was a step in the right direction. He should have enjoyed to enlarge on the subject, and have included in the roll of honour all the men whose work merited it, among which the name of Siemens would certainly have been found. He had not experimented in the matter of bringing the gas back into the producer; but the saving effected by using the coke in the still was considerable. Economy of fuel was arrived at, notwithstanding the fact that they did not put red-hot coke into the producer. The retorts were not designed for carbonizing cannel. With respect to Mr. Gibson's remarks, all engineers would appreciate the fact that there was less stress and strain with the vertical system; and when it was realized that the discharging gear, which was very strong in proportion to the work it had to do, bore the weight of the charge, the retort was more and more a distilling apparatus. The question of the inspection and repair of vertical retorts had been got over very completely. The upper portion could be reached from the top of the retort; and any repairs could be more easily effected than in the case of sloping retorts. It was generally considered that horizontal retorts were easy to deal with simply because one was used to them. With regard to costs, the capital charge must be added to the labour costs; but, with all capital charges and depreciation taken into account, he was sure a considerable saving would be shown. The temperature at which oil was used was 2600° Fahr.; but the same treatment would not do for the hydrocarbons. Referring to Mr. Ginman's remarks, it was claimed for the vertical system that it was going to help the smaller works more than any system of machinery that had been introduced in the gas industry. With regard to coke-ovens, the object was, of course, very different from that of gas-works practice. There, a great bulk of coke had to be considered; whereas in gas-works everything had to be subservient to producing the maximum quantity of gas.

Mr. Alwyne Meade on Water Gas.—At the Students' Meeting held at the Institution of Civil Engineers on the 17th inst. (Mr. Henry Woodall, M.Inst.C.E., in the chair), Mr. Alwyne Meade, a student of the Institution, read a paper on "The Production of Water Gas." According to a synopsis of the proceedings since received from the Secretary of the Institution, the author described the different plants commonly used for the manufacture of water gas, and compared the product with coal gas and suction gas in its use as an illuminant and a fuel. At the close of the discussion on the paper, the Chairman briefly addressed the meeting on the general advantages and disadvantages of the use of water gas, with special reference to its value in English practice. The rules of the Institution as to Students' Meetings prevent any further notice being given of Mr. Meade's paper.

SOME MODERN ASPECTS OF GAS.

By W. Upton.

[A Paper read before the London and Southern District Junior Gas Association, March 24.]

Amid the general detail surrounding us in our daily routine, the attention is apt to lose the sense of proportion, the sense of comparison, and the relative part that "our little bit" plays in the whole; and it has occurred to me that a few thoughts on the more general aspects of matters connected with our industry might be of interest.

Systems of Carbonization.

It is but a very few years ago that the question of "Inclines *v.* Horizontals" was fought out at great length; and inclines, with the addition of machine coal handling, scored a great success. But in the light of after-knowledge, it would appear as though many of the claims made on behalf of the inclines were really due to the adoption of regenerators and machinery, and not to any slight difference in dimensions of retort or any particular angle of setting, as no sooner was the old horizontal system equipped with gaseous heating and machine stoking than it was seen it would easily hold its own against its new rival. At the same time, it is to be remembered that, had not the inclines been introduced, with the absolute necessity from their physical situation of coal elevating machinery, it is very probable indeed that the introduction of charging and discharging machines to horizontals would still have remained undeveloped. I think it well to mention this, as an object-lesson occurring in our own time of how careful we must be in endeavouring to effect a comparison. A true comparison is an extremely difficult matter to evolve at all times; and it is very essential that the value of all variables be arrived at before commencing on the serious work of comparing results, the consequences of which may mean being committed to expenditure.

We have now several systems of vertical retorts among us, all more or less surrounded with many patents, and, according to everything that one can learn, giving excellent results. But they cannot, in the nature of things, expect an immediate success similar to that which occurred on the introduction of inclines, inasmuch as they have to compete with existing efficient systems of "slopers" and horizontals, both retort and chamber. Further, we have to keep in view the many and great improvements that are taking place in coke-oven plants, and the possibility of making use of their waste gas as a help to the ordinary gas supply. There are cases of this being done with advantage by some large plants in the United States, and also in Germany. But mere cheapness is only one point to be considered in any such linking-up. The question of continuous supply comes before all; and until this can be guaranteed, it would be inviting a large element of risk in addition to those we normally look for. In coke-ovens, coke is the chief product; whereas the conditions in our works are quite the reverse. Hence the fundamental difficulty of reconciling these diverse factors, and trying to arrange them in harmony. The subject is very interesting, and one that undoubtedly we shall hear more of in the immediate future. The point which is sometimes raised, of the conservation of our natural resources, need not trouble us. Like everything else in our business, it is £ *s. d.* that governs the situation. If a scheme pays—that is, if it be economically a success—then we cannot afford to worry about the natural side of the position. Everything is transitory; and long ere we have made any impression on Nature, our process may be defunct.

The Need for Experimental Work.

A point here that occurs to me is that both the incline and vertical systems of retorts, as well as successful coke-ovens, were introduced from Germany, where they had made considerable progress before being tried in this country. Carburetted water gas was similarly developed in the United States; and many of the present ideas of purification in closed vessels have originated on the other side of the North Sea. Why these general advances on new lines should have occurred away from the home of coal gas, where the manufacture was first originated, is a point worthy of some considerable thought—especially remembering that vertical retorts, as such, have been in use in Scotland for over half-a-century. True, the distillation of shale for oil is different from the distillation of coal for gas; yet the idea was there all the same. Incandescent burners and the mantles, also, did not originate here; and the truth, shortly, is that not enough experimental work has ever been done in this country, nor encouragement given to new ideas. However, the times are changing; and the point I wish to make is that you who are among these changing conditions should make every effort to keep abreast of the times. The old methods of gas supply, both on the works and in the office, have in many cases gone completely, and the movement is general and visible; and therefore, on the many visits which our Council arrange for the inspection of various processes of manufacture and distribution, it is imperative that full advantage be taken of closely inspecting and comparing new designs and ideas.

It can be remembered with pleasure that one of the Junior Associations in the North counts a well-known inventor and experimenter among its members; and, from the results of a recent visit of this Association to Stepney, where some new ideas as to metal melting by the use of town gas were exhibited, we are assured that we do not lag behind in the possession of intellect. This is as it should be; but there must be much more of it all round, if we are to hold our own with success. There cannot be any doubt that the great strides forward of late in all branches has been the direct result of the keen competition we are meeting with from our friend the electric light; and no one can deny the benefits resulting from the struggle. Better men and apparatus are in more constant demand than ever. A friend of mine has occasion now and again to obtain good men for service abroad; and it is interesting to note the greater variety of knowledge displayed by those who offer themselves now than even a few years ago. Such men are valuable from all points of view.

The Best Quality for Gas.

The question as to what is the best quality of gas to supply has resolved itself, at any rate for the present, into a value of about 14 candles, and as high a calorific value as the coal will yield. But the limit has not yet been finally decided; for, assuming for the moment the possibility of the creation of successful means of converting all the hydrocarbon contents of the original coal into gas of a very much lower candle power than the present, there is no possible doubt that such a system would be adopted, and the standard—if it is a standard—be further reduced. The natural gas supplies of the United States, for instance, have but a few candles value, but used in the incandescent burner are all that could be desired. To my mind, the industry that can only convert some 15 per cent. of its raw material (coal) into its finished product (gas) leaves very much to be desired. That we are doing the best in the present state of knowledge, does not alter the fact; and if it is looked at from this point of view, it will be seen what a great advance is yet possible. Several ideas on these lines have from time to time come forward; but it still remains to be performed. The success, or even partial success, of any such system would place gas supply here on the same basis as that occupied by the natural gas supplies of America—that is, the universal heating agent—and would do that which the Smoke Abatement Society are unable to accomplish—render the use of coal-fires, with their dirt, a thing very much of the past.

Coke Considerations.

Under present carbonizing conditions of high heats, coke tends to become harder, and, if I may so term it, "drier," and is different from the coke of a few years ago of lower temperatures. From this point of view, it appears rather a matter of regret that a more easily lighted and freer burning coke has not been successfully produced. Coalite, of course, occurs to the mind; but for many reasons it does not appear to yet meet the case. Closed fires to burn the coke as now produced are not acceptable in our climate; and hence coke remains largely a drug on the market, as far as domestic use goes.

A Calorific Standard.

In place of the vanishing standard of illuminating power, it is most probable that in due time an alternative standard may be imposed, and that a calorific one; and as it appears the order of the day to compass a public supply service with as many restrictions as possible, I suppose in due course we may look to come under some such obligation. Adherence to such a duty doubtless will be difficult, particularly so among the changing conditions of manufacture; but there can be no doubt that in the long run it will prove very beneficial to the industry. At the present moment, much remains in a state of transition. For instance, of the various companies supplying this City no two are in constant agreement as to calorific value; and hence gas apparatus has to be adjusted for the quality of gas ruling in each section. This is comparatively easy of accomplishment; but what forms a serious ground of complaint is the varying pressures given throughout the day. If the milk and other household requirements were delivered in daily varying quantities, I am afraid trouble would soon be in evidence; and certain it is that in this respect we have to more and more conform to the conditions under which all trading is carried on—*i.e.*, regularity of service or supply. Gas-fires that refuse to incandesce in the early morning, for want of pressure, are not an advertisement; and the fact that they can cheerfully roar in the evening, with excess of pressure, does not counterbalance their earlier errors. If the mains are at fault, they must be altered. Nothing should remain undone to keep the pressure ample and regular.

Distribution.

Distribution has had its share of change. Pressures of ½-inch of water at the consumers' meters have gone for ever; and the present *desideratum* is not less than 3 inches—and this constantly throughout the day, and, if the efficiency of the public lighting is to be maintained, as it must be, not much under it at night. The fear of possible increase in leakage has militated more than anything else against the idea of giving a district increased pressure; but more courageous views have demonstrated that, even if a fractional rise in percentage is shown, it is immeasurably outweighed by the increased satisfaction given to the consumer. I have a case in mind where, in a large city, the pressure was raised from its old-time standard of barely 1¼ inches at the meter to 3 inches; and the consumption rose to nearly half as much again, with no complaints. The fact was that, owing to the fear of increased leakage, the district was being starved, and complaints of so-called "bad gas" were numerous and constant.

We have to remember that undoubtedly ere long the pressures

will have to be still further raised. The introduction of gas fires and cookers and the growing use of gas for commercial purposes—the extent of which will be ruled entirely by the price charged—are going to make large demands on the capacity of mains laid years ago; and this can only be met by booster mains feeding the district at many points, or by increasing the general pressure. In view of the many advantages to be obtained by the latter system, one is inclined to entertain the idea that this will be the ultimate outcome of the present general drift. Further improvements in lamps, of which there are rumours current even now, may render it possible to obtain efficient large units of light from gas pressures much under those now deemed necessary, in which case separate compressing plants would not be required. It is to be hoped that our own industry will produce the necessary inventor, and break the dreary monotony of going abroad for him.

Long-Distance Distribution.

Another point that has often occurred to me is the very short radius within which gas is supplied by a big town. The country has been described as a large region commencing just beyond the last street-lamp; and accepting this definition, it would appear to be the case. Within (say) a 10-mile radius of any large town in this country, are usually a number of small villages, which would readily take their gas if it were possible. In Germany, there are several instances of such supply served by means of compressed gas; and in the United States, the home of piping gas for long distances, such cases are common. There is one notable instance of this being done in Kent; but it ought to be a common practice. In a small foreign gas-works I know, there is a high-pressure main 14 miles long, boosting up the low pressure along the district at several points, and finally feeding a small township it would not have paid to lay cast-iron mains into; and ere long several more similar settlements will be served in like manner. By doing so, an alternative is given to the inhabitants as against the electric light, and, as it pays, surely it is possible here—and that on a large scale.

Maintenance.

The centres of our large business towns have in general been lost to gas through the want of a proper system of maintenance; and particularly so is this the case in most large towns, with their countless offices. No one has the time—even if possessing the knowledge and the inclination—to keep a watchful eye upon gas-fittings, and to repair in due time the onslaughts of those entrusted with the cleaning of the buildings. And hence, when light is required, particularly in the first of the dark days of the autumn, everything in the gas line is out of gear, and as a last resort electricity is installed—never to come out again. It is a matter of continual surprise that this rich section of the business has not been properly catered for. The costs of (say) a weekly inspection would form but an infinitesimal addition to other charges of the office, and would be looked upon quite as a business charge, and in a different light from a maintenance charge for (say) a private house.

Maintenance of lamps for shops is making some headway; but not enough is being done. Walk through any shopping district in London, and note the number of lamps, both inside and out, that require attention—most of them badly. All the consequent dissatisfaction comes back, directly or indirectly, on to the gas company, and is felt when our competitor (electricity) comes along.

Consumers will have to receive more and more consideration; and in the giving of it gas companies will come more and more to realize their position as traders looking for custom. That such a system pays, and pays well, is undoubted, and can be seen by the increased volume of business that has come to the industry these past few years, since the more enlightened policy was instituted. As methods for the application of gas increase, the call is for more efficient men and special apparatus. The former we hope to supply; and the latter (if we do not have a hand in inventing or shaping out) we shall be able to give efficient handling, and do our part to make a great success of it. Hence no means must be neglected of acquiring new knowledge, which is not difficult, if only we have an intelligent interest in our work.

The increase in gas output naturally reduces the proportion of standing charges per unit of volume, and thus tends to automatically lower the price charged to the public. Therefore we should strive to increase the output in every direction.

Discussion.

The President (Mr. L. F. Tooth) said the remarks made by the author were very candid and instructive, and would give them all something to think about.

Mr. J. G. Clark expressed the opinion that the paper was not one upon which the members could ask many questions; but some of the points made by Mr. Upton might perhaps be emphasized. The author spoke of the great progress of the gas industry; and he (Mr. Clark) thought it behoved them to be prepared for this. A higher order of education would no doubt be required than they had been used to in the past; and his advice to those who would be coming along in the future was to be well acquainted with first principles. It seemed to him that the importance of this was not sufficiently realized in modern technical work. If they tackled their work from first principles, they would find that it would become much more simple. For instance, there were a large number of good compressors on the market; but if they examined them from first principles, they would see that there was very little difference between them. Dealing with the matter from this point of view, the study of the multiplicity of apparatus with which they nowadays had to concern themselves became quite a simple affair. Mr. Upton referred to the question of pressure, which no doubt was very important, and would be still more so in future. His own opinion was that the governor would in time to come be a most important piece of apparatus in connection with gas supply; and it behoved all those who were interested in distribution work to be prepared for this state of things. Different appliances required different pressures for their most efficient action; and, moreover, apparatus was made now on more scientific and precise lines, and so needed more precise regulation of pressure, which was most easily accomplished by means of a governor. As to the great progress that had been made in regard to lighting appliances, a few years ago 20 candles per cubic foot was considered quite a phenomenal figure; now they had much higher values. He himself was acquainted with a low-pressure system by means of which more than 40 candles per cubic foot could be obtained, without any reflecting aid; and he thought they might anticipate in the near future a corresponding advance in high-pressure work, so that the 60 candles per cubic foot which they looked upon now as a normal figure would be left behind. At any rate, they hoped that this would happen in the course of the next few years.

Mr. D. J. Winslow remarked that the author had deplored the lack of maintenance of incandescent burners; and, of course, they all deplored this. It was unfortunate that they did not seem to be able to get enough of this class of business; but he thought the private house maintenance suffered more than anything else. At any rate, in Walthamstow (where they had not very many large houses) great difficulty was experienced in getting the consumers to allow the Gas Company to send a man to clean their burners even once a month, for which service the charge made was extremely low. Perhaps a few would come on in the autumn, as the result of special canvassing; but after about three months' experience, they would probably say, "We think we will do that ourselves now." One of the chief causes of this want of success in securing maintenance work seemed to be that the mistress of the house was not always quite sure when she would be in, and did not care for the man to call when she was out. On the other hand, houses where electric light was installed appeared often to maintain a better and brighter light than the gas consumers, for the simple reason that they had to renew the lamps in time. But there was not a man calling round once a month to put them in order, as with gas mantles. As to governors, he had come across a tradesman who had been much worried because a canvasser from a firm who supplied governors had called and showed him testimonials from people who had been able to reduce their gas bills by 50 to 75 per cent., and had, of course, tried to get an order. These testimonials, however, appeared to be from people who, from the character of their business, might be likely to employ a good many flat-flame burners, so that a governor would be of use; and when his (Mr. Winslow's) advice was sought by the customer in question, he pointed out that, with up-to-date, properly-regulated, incandescent lighting appliances installed, he could not expect to get anything like the same advantage.

Mr. A. E. Brown said he had come across a case where a large factory was canvassed by a governor maker, who talked of a large saving. The factory people spoke to him (Mr. Brown), and an inspector was sent to the place. The inspector reported that he did not see how they could profitably introduce governors anywhere there, except perhaps in connection with a small water-heating apparatus, in spite of the fact that the canvasser had guaranteed a very large saving. The suggestion was then made by him (the speaker) that, as possibly the inspector might not be considered altogether unbiassed, another well-known firm of governor makers should be called in. This was done; and this firm of governor makers deserved a good word. They spent a lot of time going over the factory, and then came to the same conclusion that the inspector had done. The result was that they had a very small order, which scarcely recompensed them for the trouble they had taken. That they were so candid in their advice was a fact which ought to be stated, in fairness to the governor makers.

Mr. A. Broadbent, referring to the question of maintenance, said it was satisfactory to know that in the district of the Gaslight and Coke Company the number of burners on maintenance had increased by over 30,000 in the last three years.

Mr. G. F. Cox said that, in connection with pressures and governors, an important point seemed to be the question of cost. Who would be expected to pay for the governors—the consumer or the company? They all acknowledged that a general increase of pressure was necessary; but, at the same time, he thought they should not altogether run away from the fact that the ordinary tap on the burner was a governor which was easily manipulated, and was already in position, whereas a pressure that would entail a governor on the service would cost money.

The President expressed the opinion that they did not want governors at all. If they had a constant pressure day and night, or at the given times when the maximum load was on, and made the burner adjustments accordingly, what would governors be needed for? They were an abomination to gas suppliers—always had been, and always would be—for the simple reason that they blocked and corroded, and reduced the pressure. And while they were reducing their pressure, they were reducing the efficiency of their appliances. The reply would be: "If you increase your

pressure you create noise, and you add to your gas accounts." But this was not so. If the consumer had a burner with a regulating nipple, and there were set and constant pressures, the consumption could not be increased, but the light would be. As to noise, this depended upon the burner. Assuming it was a "C" burner, there would be a regulating nipple, or, as Mr. Cox had stated, the consumer could turn the gas down at the tap, in which case there was a certain loss of pressure. By means of the regulating nipple, they could close the holes, and so reduce the consumption. If they wanted to stop the noise, it was no use shutting air off; what they had to do was to reduce the size of the ignition point. If the burner was working with a gauze at the top having (say) 28 meshes to the inch, this would be changed to (say) a 30-mesh, so as to reduce the ignition point. The same thing applied to the inverted burner. They had only to reduce the nozzle; and if the burner had a gauze, they could reduce this gauze in size also. The gas was the force; and the air supply depended upon the force. The air supply depended entirely upon pressure; and while they had this, they must secure increased efficiency. It was an absolute fallacy to advocate lower pressures. They wanted higher pressures, which spelt efficiency.

Mr. F. Ainsworth remarked that, while in the main they were all probably in agreement with the statements of the author, the discussion had brought out points on which one could say a good deal. With regard to the question of governors, when the pressure got above a certain amount, it would become necessary to consider all the circumstances. They had to contend with the burners existing in a district, whether they liked it or not; and if the pressure was raised to a higher point than the burners would stand, good results could not be obtained. He was in favour of high pressure, providing they had burners in accordance with it; but this they had not, and therefore they had to fight against difficulties in their different districts. This being so, pressure could be a great drawback, as well as an advantage. There must be sufficient pressure to supply every consumer in a district; and no doubt many places were in the difficulty of giving too high a pressure in one part of the area, or too low a pressure in another, in which case they had to choose the less of two evils. Anyone who had to do with distribution must admit that, if they had a burner made to work at 12-10ths, they were not going to obtain satisfactory results with it at 3, 4, or 5 inches. He was very much in favour of using regulators, without which he thought they could not very well manage to do, unless they had a constant pressure and a constant quality, which was what every gas engineer was doing his best to secure. If they could get the proper burners, they would be in a position to work at any pressure; but he was not quite sure that they would be able to secure quietness. They did not get quietness with a high pressure. As to altering the size of the mesh, he had "C" burners in his district which in one week became stopped up with fluff, &c.; and they had to teach the consumers how to deal with this matter. If they had a smaller mesh, there would be a tendency for the burner to stop up even sooner. Special gauze might obviate this to some degree, but not, he was afraid, to the extent of the President's experience. No doubt there were many good governors now; but sometimes when (say) only one or two burners were turned on they failed to act, while in connection with gas-fires he thought it would be found they would all stick at times.

Mr. Clark said it had been remarked that the tap was a governor to some extent. Of course, they knew that, with intelligent attention to the tap, one could do a great deal. But let them consider gas-fires. Looking back a few years, they would realize that the gas-fire had reached a remarkable state of perfection; but there were two main conditions which went to make up the efficiency of the gas-fire, in addition to chimney draught. The first of these was a definite and a constant pressure; and the second was an injector and air chamber properly regulated to work at this pressure. Obviously, therefore, it became a question of vital importance to maintain a constant pressure at the gas-fire. They knew that nowadays they could maintain a fairly constant pressure in the district. That was to say, if they took the pressures in the mains at a large number of points in a town, it would be found that the pressure was pretty uniform through the day. If, however, they investigated the conditions inside a house, they came across quite a different state of affairs. There was a drop of pressure in the pipes; and though there might be constant pressure in the mains, there was no means of ensuring constant pressure in the house. A fire might be 50 feet from the main; and there might be a cooker on the same supply, which when it was alight would increase the gas consumption to such an extent as to affect the pressure. Under these conditions, the requisites for obtaining the greatest efficiency from the gas-fire were no longer present; and in his opinion the only way to overcome the difficulty was to put a governor on the fire. By doing this, they were absolutely independent, providing there was adequate pressure, which was usually available. With a governor they could maintain the conditions which produced the maximum of efficiency; and as they were so desirous of pushing gas-fires, he could not help thinking that governors in this connection would be very important.

Mr. Ainsworth said that, as far as gas-fires were concerned, he was very little troubled now with noise. Some years ago, he had great difficulty in getting fires to burn anything like quietly; and he set to work and devised a tap which not only acted as a tap, but which one could also regulate.

Mr. J. Hewett thought the question of the employment of a governor was one which depended entirely upon circumstances. Of course, the use of a governor must be perfectly obvious to people who experimented. In experiments where accuracy was required, there would be an initial governor, and then perhaps a balance governor afterwards, so as to get the consumption at the burner in good condition. The whole experiment would be spoilt if for a couple of seconds the consumption at the burner increased 5, 10, or 15 per cent. In that case, therefore, the governor was necessary. Of course, it was useful in some circumstances, and worse than useless in others. If they could put a man to stand and watch the governor constantly, it would be all right; but they could not do this, and when something went wrong with it the consumer was apt to get upset and treat it in an unsuitable manner—especially if it was a mercurial governor.

Mr. Upton said that, from the experience quoted in his paper, it would seem they could not give people too much gas in a general way. The piping about a house was very seldom properly dimensioned; and unless there was a good pressure on the meter, in small houses results would not be satisfactory, especially if gas-fires had been put in. The tap was, of course, a governor if it was used that way; but it was a thing which required intelligence in its working, and did not always get it. They might come across a small proportion of people who would be content to adjust a tap during the evening as the pressure rose; but they would not find many of them. The question of governors was related to that of pressure. Assuming it were possible to get a level gauge on the mains right through the daylight hours, he could not see quite what was the use of a governor, because nipples could be provided to deal with the particular pressure and quality of the gas. This brought them back again to the question of what would be the pressure they should consider as normal. Only a short time ago something inside of an inch was thought normal, and perfectly good. To-day they heard various expressions of opinion; but considerably more than an inch was the rule. He put it down at over 3 inches. And what was thought proper to-day, might be doubled to-morrow. It was all a question of progress. If they crept up like this, and adjusted the burners to the increasing pressures, he could not see that governors were needed. When distributing, as was done in some cases now, not at a few inches, but at several pounds pressure, the gas consumer's service was governed-down by a mercurial governor. This occurred in various instances in America, where gas was distributed to consumers in mains at a pressure of 20 lbs. or more. But with the modest pressures at present in vogue in this country, the governor proposition did not appeal to him. If they could be assured of having a constant pressure on a district, there would be no difficulty in getting manufacturers to turn out burners suitable for it. It seemed to him that the burners should be dependent on the pressure, and not that one should have to take a burner, and make the pressure suit it. The point as to who should pay for the governors was not one that need be taken into consideration at present. But presuming that the company, for the sake of argument, by raising pressures were saving themselves a very large capital outlay in providing bigger mains, and were therefore obtaining a great advantage, it seemed that the onus was on them to provide the governor. They might remember that some time ago one of the electric light companies raised their voltage, and had to stand the expense of altering the consumers' fittings, &c., to meet the different conditions. The company were obtaining an advantage in the saving of capital outlay; and this example might answer the question that had been put. Varying pressures with gas-fires were certainly a trouble.

On the proposition of Mr. E. G. Stewart, seconded by Mr. Winslow, a hearty vote of thanks was passed to the author.

VERTICAL GAS-RETORTS IN GLASGOW.

Visit of the Scottish Junior Gas Association.

On Saturday afternoon, the Scottish Junior Gas Association (Western District), on the invitation of Mr. Alex. Wilson, the Gas Engineer to the Corporation of Glasgow, paid a visit to the now all but disused Temple Gas-Works, for the purpose of viewing the experimental setting of vertical retorts which has been erected there to Mr. Wilson's design. The visitors numbered nearly a hundred; there being included among them not a few gentlemen who hold positions in the gas world above the rank of junior. Mr. Wilson was there to receive his guests; and so, also, was Mr. A. MacLeod, the Manager of the works.

The vertical retort installation is placed in the old retort-house, now dismantled, beside the oil-gas plant, which was devised by the late Mr. W. Foulis, and which is now also altogether disused. It may be mentioned, as an illustration of how quickly processes are sometimes superseded, that when the Provan Gas-Works were erected, in 1904, the late Mr. W. Foulis, their designer, had an installation of oil-gas plant placed in them; but the policy of enrichment having given place to one of reduction of illuminating power, the plant has never been lighted up. The visitors on Saturday thus saw, standing side by side, plant which was, not so very long ago, the object of great expectations, but now scrapped, and plant of which still greater expectations are entertained, which has, as a matter of fact, worked so well in its experimental stage that it has been adopted as the model upon which a very large

installation is to be erected in the immediately adjoining Dawsholm Gas-Works.

The experimental plant consists of four retorts, 20 feet in depth, and increasing in width from top to bottom. A fixed hopper over the bench serves the coal into the retorts by a valve arrangement which is applicable to two retorts. At the bottom, there is a water-seal. The process is intermittent; drawing taking place every four hours. Hydraulic power is used for the opening of the bottom valve, and, after the measured quantity of coke is withdrawn, closing it again. The coke comes out quenched, and is hard in texture and clear in appearance. It is dry and light, and of high heating power. There is no measuring of the coal as it is charged; all that is done being to fill up the vacant space at the top which the draw has created. The charge averages about 9 cwt. Both the charging and discharging plant are found to work with great smoothness and reliability. The visitors saw both operations performed, and were unstinted in their praise of the operations—everything working with ease, and the whole process being noiseless and clean. In the installation of 144 retorts which is to be erected in the Dawsholm works, the only variation from the experimental plant will be that the retorts will be 22 feet in length; and the accessories will be of a permanent and more complete character. Preparations are already being made for the erection of the retorts in Dawsholm; and the expectation is that they will be ready for gas-making before next winter.

The visitors, after seeing the operations above and below, and a number of them having looked at the regenerator, were entertained to tea at tables set out in the retort-house. Afterwards they were taken to the testing-station, which is used for the Dawsholm works and for the vertical-retort plant. An iron retort is charged with a hundredth-part of a ton of coal; the test for all samples being of the same duration, and at the same temperature —1750° Fahr. The gas passes through condensers, a washer-scrubber, and lime purifiers, to a holder, on which is a graduated scale from which the yield is calculated. The gas is well mixed, and then a sample for testing for illuminating and calorific power is taken, and the gasholder is emptied for another test. The test for illuminating power is made upon a bar photometer, with a No. 2 "Metropolitan" (Carpenter) burner, and also with a No. 8 Bray burner. For the ascertainment of the calorific power, a Boys calorimeter is employed. The work of testing having been witnessed by the visitors,

The PRESIDENT (Mr. J. Frazer, of Provan) said he thought the least they could do, before they left, was to thank Mr. Wilson for the invitation he had extended to them to come and see the vertical retorts. Quite a number of people at Dawsholm said that there was nothing to be seen about verticals. Perhaps there was not to those who saw them daily; but those who were not acquainted with them, found a good deal to see in them. If they looked at the simplicity of the verticals, they must admit that the plant was a wonderful one. One thing they might note—that they saw food laid out on tables in a retort-house, while the retorts were at work. He wondered where they could find another retort-house in which this could be done. So far as noise was concerned, the retort-house was as quiet as a church. These two features—cleanliness and quietness—should go a long way to recommend verticals. They closed this session with a lecture; and he might tell them Mr. Wilson had promised him that he would close next session with a lecture. When he did so, he hoped he might have something to say about verticals. They had been privileged to see an experimental station; and next year he trusted they would see a large installation. He proposed a hearty vote of thanks to Mr. Wilson for his courtesy and kindness to them, and to the officers for the part they had played in a very agreeable visit.

Mr. WILSON said he was only too pleased to arrange for the visit. As usual, he wanted to do all he could to help the juniors to fulfil the ends for which their Association was started. Anything he could do to assist them, he would gladly do. Vertical retorts had come to them as a new method of carbonizing; and he thought it was to be the method which would be most adopted in future. They had found them to work so well that they had been encouraged to go on to a much larger installation at Dawsholm; and, as the President had said, next year they might be able to see this large installation at work. The trial bench was, of course, not perfect; none of them were able to hit the perfect thing at once. But, so far as they could see, the setting they had adopted was going to do good work. It had done so well that they had adopted it in preference to horizontals. When he spoke to Mr. MacLeod about the juniors coming there, he was quite delighted. Mr. MacLeod had made all the arrangements for the visit, and had his officers there; and he thought it was to him that thanks were due.

Mr. MACLEOD returned thanks for the very hearty response which had been made to the motion of the President. He was sure his officers were as pleased as he was himself to have the Association there. When the installation was going at Dawsholm, he would be delighted if the members would pay them a visit.

Frozen concrete cannot, as a rule, be detected by ordinary inspection from concrete laid under natural conditions. Cutting out a piece, placing it on a hot stove, and seeing whether it sweats and softens, is the only reliable guide to determine whether the concrete has been merely stiffened-up by frost, or has actually set to an extent which would warrant the builder in trusting its strength.

RETORT MATERIAL FOR HIGH TEMPERATURES.

A French patent has been taken out by Heer J. G. Aarts, of Dongen, near Breda, Holland, for improvements in the manufacture of retorts or ovens for coking coal or other materials at high temperatures. The following are particulars of the invention, translated from the specification.

The inventor commences by pointing out that those who are engaged in the distillation of coal in retorts or chambers, whether horizontal, inclined, or vertical, are now more than ever in need of refractory materials which are capable of resisting the effects of temperatures above 2912° Fahr., which makers using fire-clay, silica, or their compounds find it difficult to supply. The first condition of a retort material is resistance to very high temperature; another is impermeability. An essential quality in a retort for ideal distillation is its capacity to transmit a great amount of heat per square inch of surface with a certain thickness of material in a given space of time. Finally—and this condition is particularly essential in the case of vertical retorts or chambers —the material should not be liable to contraction or expansion at temperatures ranging from 1830° to 3630° Fahr. Impermeability can be ensured to a large extent, and heat conductivity increased, by taking material of greater density than is generally used.

The material which is the subject-matter of the invention is silicium carbide in an amorphous or crystallized state, and mixed with binding material, preferably fire-clay; and the inventor claims that it fulfils all the conditions previously specified. He states that retorts made with it will easily stand a temperature of 3630° Fahr., and resist the mechanical action of coal and coke, even where the charge is continually moving. A silicium carbide retort, cemented and calcined, is impermeable to gas and vapours, owing to the great density and amorphous nature of the material, which becomes vitrified on the surface under the influence of high temperature. Such a retort will, it is claimed, meet the strictest exigencies of industrial application as regards impermeability; while heat conductivity, which is so essential a point in the case of distillation in closed chambers with outside heating, will be improved—the capacity of silicium carbide being at least five times greater than that of the best fire-clay products hitherto employed for the distillation of coal. It is three times greater than cast iron, and is only equalled by graphite, which, owing to its great affinity for oxygen at a high temperature, cannot be utilized in connection with the distillation of coal in retorts. For the same thickness of wall, the weight of material is 30 per cent. greater, on account of its higher specific gravity. Heer Aarts says it does not shrink or expand, whatever may be the temperature employed, or however great the variations.

Entire retorts, sections, or bricks can, the inventor says, be manufactured in the same way as when ordinary refractory materials are employed—viz., by mixing the silicium carbide with its cement, and moulding the paste before burning. They can, however, be made by a direct method which is described in the specification.

APPLICATIONS FOR LETTERS PATENT.

6254.—SPOONER, J. E. G., "Vertical mantle." March 13.
6272.—HACKING, R., "Automatic electric valves for use with gas lighting." March 13.
6325-6.—HOPKINS, J. H., and STANSFIELD, A. M., Carburetting apparatus." March 14.
6342.—AULD, D., AND SONS, LTD., AULD, J., and GRAHAM, J., "Pressure-reducing and governor valves." March 14.
6383.—GIBBONS BROS., LTD., and MASTERS, R., "Vertical retorts or ovens and bricks therefor." March 14.
6384.—GIBBONS BROS., LTD., and MASTERS, R., "Annealing furnaces." March 14.
6455.—HAWLEY, H., "Purifier grids." March 15.
6461.—WRIGHT, G. B., "Utilizing waste gases from furnaces." March 15.
6541.—ROGERS, F. H., "Gas-tubes." A communication from F. Gratieux. March 15.
6548.—BEST, W., and PONSONBY, A. C., "Gas-regulators." March 15.
6564.—WRIGHT, H. N., "Incandescent burners." March 15.
6596.—BUTTERFIELD, J. W., "Stoves for coal or any other combustible products." March 16.
6610.—CORT, R., AND SON, LTD., and ROBINSON, C. P., "Luting for gas apparatus." March 16.
6617.—OFENBAU G. M. B. H., "Horizontal coke-ovens or retorts." March 16.
6625.—HOLZAPFEL, A. C. A., "Gas-producers." March 16.
6672.—PLATT, A., "Gas-alarm." March 17.
6716.—SADLER, H. S., and ASHMORE, BENSON, PEASE, AND CO., "Holding down lids or covers to their bearing surfaces." March 17.
6719.—SMITH, E. W., and WALTER, C. M., "High-pressure burners for heating." March 17.
6732.—SHARP, A., "Generation of power." March 17.
6786.—SEDDON, E. H. & A., "Compressors." March 18.
6798.—THOMAS, L. J., "Artificial fuel." March 18.
6802.—SEDDON, E. H. & A., "Inverted lamps." March 18.
6835.—DOUGLAS-JONES, W. D., "Hinged or elbow joints." March 18.
6849.—STEPHENSON, J., "Generation of water gas." March 18.
6868.—HOWELL, H., "Inverted gas lighting." March 18.

REGISTER OF PATENTS.

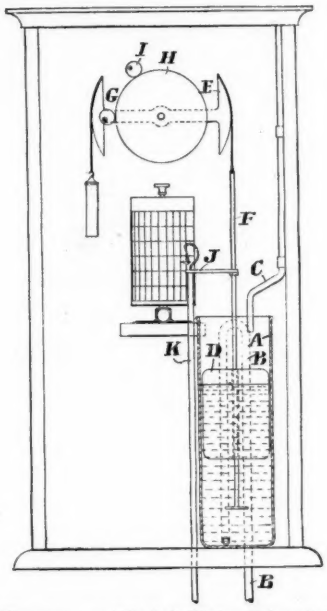
Water-Driven Integrators.

ABADY, J., of Temple, W.C., SIMMANCE, J. F., of Westminster Palace Gardens, S.W., and YORKE, W., of Longsight, Manchester.

No. 1397; Jan. 19, 1910.

In this invention, the water to be measured is allowed to pass over a weir of the type described in patent No. 19,800 of 1909—that is, so shaped that the rate of discharge at any instant is proportional to the head. The patentees point out that if the weir be formed in, or fixed to, the side of a tank, and a float be placed in the liquid on the up-stream side of the weir, and the vertical movements of the float be recorded on a chart or recorder driven at a uniform rate by clockwork, the area of the diagram enclosed by the datum line of the chart, and a line drawn on it by the float pen and the two extreme vertical ordinates, will, during any portion of time, be proportional to the quantity of water discharged during that time. In the present invention, a water-driven integrator is provided which shows at any instant the result which would be obtained by evaluating the area of the diagram as given by the automatic recorder.

The water-driven integrator is intermittent in action. A narrow, vertical vessel, open at the top (of height greater than the maximum head over the weir), is provided with a syphon-tube and with a small pipe by which it can be filled with water from the weir-tank; the bore of the syphon-tube being larger than the supply pipe. If the water enters the vessel through an orifice of fixed size and under constant head, the time of filling and emptying it will be constant. The rate of flow of water entering the vessel can be varied by a cock; and as the head can be varied by an adjustable "constant overflow" vessel, it is obvious that the number of strokes per hour which the integrator makes can be varied at will. When the water-level in the vessel rises to a certain height, it overflows and escapes by a tube which sets the syphon in operation, which then proceeds to empty the vessel. When the vessel is emptied, it is again gradually filled; and the action is repeated. Inside the water vessel is a small integrating float, which rises and falls as the vessel is being filled and emptied; the parts being so arranged that the position of the integrating float, when the water-vessel is empty, corresponds to zero head of water at the weir. A portion of the vertical movement of the integrating float equal or proportional to the head of water at the weir at the instant is communicated to the counting mechanism of the integrator.



Abady, Simmance, and Yorke's Water-Driven Integrator.

One arrangement for producing this result is the following: An oscillating lever is mounted conveniently adjacent to the water-vessel; and from one end of the lever is suspended a rod with a disc at its lower end—the rod and disc dipping into the water-vessel. The integrating float has a central hole, and is threaded on the rod and rests on the disc. Thus it is able to move freely up and down the water-vessel; while the weights suspended from the oscillating lever are so adjusted that the suspended rod follows the integrating float on its upward movement, and is carried by it on its downward movement. Mounted on the oscillating lever is a pawl, which runs free during the upward journey of the suspended rod and engages with a ratchet-wheel or the like during the downward movement. A stop is fixed to the suspended rod in such a position as to come in contact with a forked arm attached to a rod connected to the weir-float. Thus, while the vessel is being filled, the integrating float and suspended rod rise until the suspended rod is arrested by the forked arm connected to the weir-float, thereby giving a movement to the oscillating lever proportional to the head over the weir at the instant. The water continues to rise in the vessel, carrying with it the float, and ultimately overflows, whereupon the vessel is emptied and the integrating float descends until it again rests on the disc, and forces the suspended rod to the bottom of its stroke—transmitting through the ratchet-wheel to the counting mechanism a movement proportional to the head over the weir at the instant. Thus, if the head of water at the weir does not vary very much between two successive downward movements of the integrating float, the counting mechanism will measure with practical accuracy the quantity of water discharged during the time the integrator is in action.

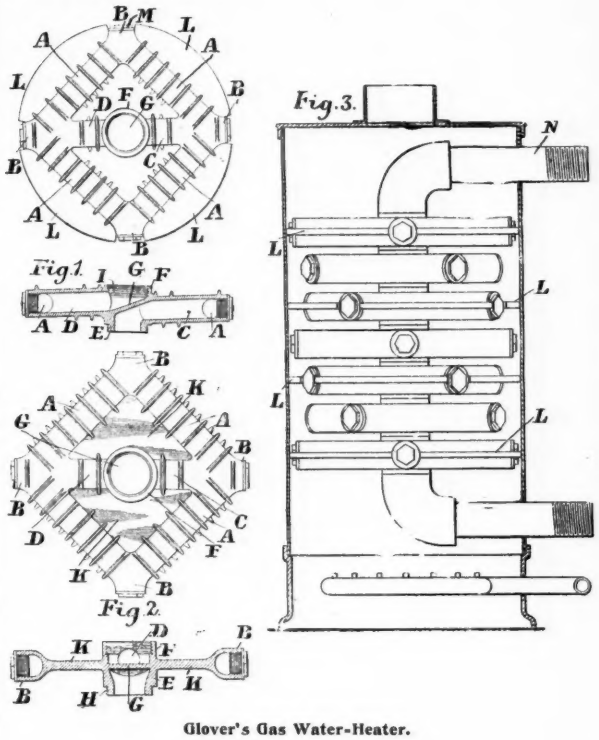
The illustration shows the water-driven integrator referred to. A is the water-vessel; B, the syphon-tube; and C, the small pipe by which the water-vessel is filled. D is the integrating float. E is an oscillating lever with two segmental ends mounted on a horizontal axis. The suspended rod F, having a disc at its lower end, is suspended from one end of the lever E, and a counterweight is suspended from the other end. G H are the pawl and ratchet-wheel (indicated without teeth); the pawl being a cam mounted eccentrically on the oscillating lever. During the upward movement of the float the ratchet-wheel remains stationary; the pawl sliding relative thereto. A ground pawl I mounted on an axis on the frame of the apparatus prevents movement of the ratchet-wheel. During the downward movement of the float, the pawl G engages with the ratchet-wheel H, and transmits the required movement. A stop on the rod F, coming in contact with a forked arm J, attached to the rod K connected to the weir-float, limits the upward movement of the suspended rod. A recording drum and pen are shown attached to the weir-float, so that a record may be obtained of the varying head of water at the weir; but this does not form part of the invention.

Gas Water-Heaters.

GLOVER, THOMAS, of Edmonton.

No. 5826; March 8, 1910.

This inventor constructs hollow segments for water-heaters, which, when connected together (in any number) and with the water supply and positioned over a gas-burner, "will allow of the water travelling in a circuitous manner through same, and thereby get more rapidly and efficiently heated than by circulating appliances now in use, and, further, the segments can be readily removed from the water-heater and taken apart for cleaning."



Glover's Gas Water-Heater.

Fig. 1 shows a segment having a web outside; fig. 2, one having a web inside; and fig. 3 is a sectional elevation of a heater with segments built up.

Each segment through which the water circulates in the heater is of square shaped tube A having four holes B (one at each corner), and each two opposite one another. Two of the corners are connected by tubes C D to a socket ring E F, centrally arranged and with an angled diaphragm G inside, which serves to determine that the opening of one tube C shall be closed as to the opposite tube D. One portion of the socket ring is provided with a male screw thread on one side, and the other portion with a female screw thread on the other side for the purpose of building-up a series of segments one above the other in the heater casing. The tubes C D slightly incline upwards; the latter from its corner to the socket, and the former from the socket to the corner, so as to allow of an easy flow of the water.

In building-up, the segments are connected so that their outside edges do not occupy the same plane but take the form of a spiral or zigzag, to allow of the uprising heat from the burners having full action over all the segments. Each segment is constructed with a web—one segment having the web K on the inside and another with a web L on the outside, so as to fit the casing; these being alternately arranged so that the rising heat travels in a circuitous manner inside one segment and outside the next, and acts in a more efficient manner than without the webs. The segments are enclosed by a casing connecting the top segment with a hot-water cistern and the bottom segment with the water supply, or *vice versâ*.

The water enters the bottom segment at the socket ring E, passes under the diaphragm G and through the tube C connecting the socket ring with the square tube, then round this square tube A to the other tube D connected with the socket ring F, through which tube D it passes, and over the diaphragm G to the next segment, through each segment in succession, and then by a pipe N to the hot-water cistern.

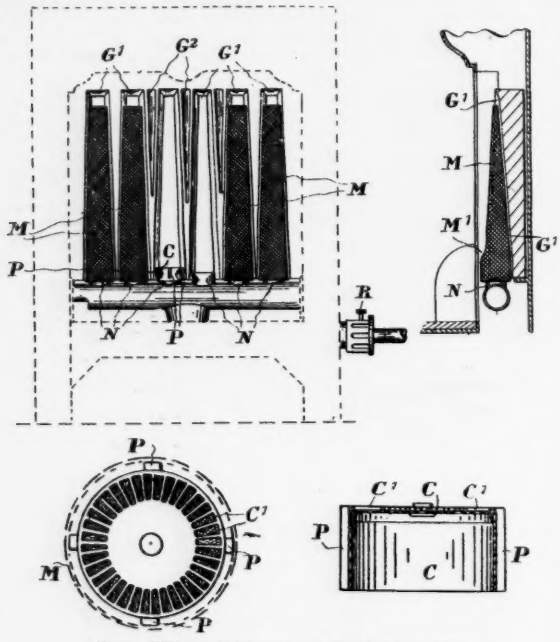
Gas-Fires.

BONE, W. A., of Leeds University, WILSON, J. W., of Armley, Leeds, M'COURT, C. D., of Balham Hill, S.W., and DAVIES, H., of Hull.

No. 10,150; April 26, 1910.

This invention relates to apparatus "whereby a hot fire may be produced and a large portion of the heat produced is radiated from the fire;" the primary object being "to construct and use, in connection with a suitable bunsen or like burner or series of such burners, a mantle or series of mantles made from a particular material, such mantle or mantles being mounted in a suitable stove or fire, and the consequent heat will be, owing mainly to the nature of the mantle and in part to the construction of the stove, readily and effectively radiated towards the room or the like to be heated."

The usual gas-fire, the patentees mention, comprises a series of burners leading from one or more main bunsen tubes, and above the burners is placed non-combustible fuel contained in a grate having a fire-clay or like back; and it has also been heretofore proposed to use bunsen burners "having placed above them iron grids or bunches of wire, which become heated owing to the action of the combustible mixture. This wire has usually been iron, which, consequent upon oxidation and other causes, has a short life."



Bone, Wilson, M'Court, and Davies' Gas-Fire.

The bunsen burner adopted is of the single or duplex type; the single type being used when but few burner-nozzles N are used; and the duplex when the nozzles are more numerous. The apertures in the nozzles are graded in size in order to ensure, as far as possible, equal flames from each nozzle. The burner is provided with means for regulating the supply of gas and air; a satisfactory device being a screw or plug R for regulating the gas supply, and an air sleeve surrounding it capable of regulation. Each burner-nozzle N is provided with a cap C, such as is used with many types of incandescent gas-burners, with openings C^1 practically equal in area to the ribs or obstructions C^2. A gauze, of about thirty meshes to the linear inch, is inserted in the burner-cap—to prevent lighting-back of the well-aërated flame.

Over each cap is mounted a mantle M, made from nickel gauze of (say) thirty meshes to the linear inch. The mantle is formed taper; and towards its base it is shaped on a curve such as at M^1—the object being to clear the flame for some little distance above the burner-nozzle, and to then, by contraction, bring the mantle back into contact with the flame. This is an important feature, having regard to a high efficiency. The mantles rest on the iron burner.

Good aëration of the flame is necessary, as should there be too little air, the nickel mantle will rapidly deteriorate, but where the flame is sufficiently aërated, deterioration does not occur, or is practically negligible. In addition to the regulating means described, the burner-cap is provided with a shield or ring of such a configuration as to keep the mantle out of immediate or complete contact with the cap. Projections P on the cap answer the desired purpose, and form air spaces between the mantle and cap.

Under the combustible action of the gas and air, the nickel mantles, it is said, rapidly attain a red glow, with little or no flame perceptible, and a large percentage of the available heat is radiated from the mantles.

The burner mantles may be mounted in a frame or stove with a fire-clay back with hollowed-out grooves or recesses G^1, to partially embrace the mantle, with a view to increasing the radiation. As the mantles taper towards the top, there will be an increased thickness of fire-clay to heat at the top; and to decrease this, further grooves as G^2 are made.

By using suitable atmospheric jets or burners and nickel gauze mantles as described, the patentees say it will be found that "the gas consumption for a given available heat will be reduced as compared with an ordinary gas-fire, and conversely for a given consumption of gas the heat radiated will be found to be greater than that now obtained from ordinary gas-fires."

Liquid Seals for Dip-Pipes.

DESSAUER VERTIKAL OFEN G.M.B.H., of Berlin.

No. 19,943; Aug. 26, 1910. Date claimed under International Convention, March 14, 1910.

This invention—"to provide a collecting chamber for the products of condensation of simple construction and enable the level of the sealing liquid in the hydraulic main to be regulated as desired"—was described and illustrated in the "JOURNAL" for Feb. 21, p. 528.

Combined Gas-Generator and Gas-Retort Furnace

KOPPERS, H., of Essen-Ruhr, Germany.

No. 14,405; June 14, 1910. Date claimed under International Convention, July 15, 1909.

In the course of his specification (unillustrated) the patentee says: In gas-heated apparatus working on the regenerative principle—as, for example, in the production of glass and steel, and especially also for the distillation of gas from coal—the gas produced in gas-generators, generally combined with the gas-heated apparatus, is usually mixed with air previously heated in regenerative apparatus; the original temperature of the gas being as nearly as possible preserved. The recovery of heat ceases, of course, when the combustible substances (gas and air) are at the temperature of the regenerator; and as the gas is introduced in a heated state, part of the stored heat is not utilized. In view of this not utilized heat, the old system of regenerating without change of flues, in two-chambered heating apparatus (recuperators), has not been departed from in gas-works, notwithstanding the low efficiency thereof. A proposal to increase the efficiency—known under the designation "Improved Siemens' Regenerative System"—purposes to take heat from the regenerative apparatus to below the grate of the gas generator, and thus to convert the carbon dioxide of the smoke-gases into combustible carbon monoxide. As is known, this regeneration of the carbon dioxide in no way reduces the "chimney" loss.

The present invention consists in constructing the apparatus with means whereby the sensible heat of the generator gases is directly transferred by known means to other substances used in the generator—such as the primary air and the water used for prevention of slag and for the supply of hydrogen—so that as regards this heat the process is a complete cycle; the cooled gas being heated again in heat-recovery apparatus, after the separation of dust therefrom, together with the air, to attain the temperature most favourable for combustion, with complete utilization of the regenerator heat. An improvement is therefore already effected by this arrangement with regard to heat-economy, owing to the continuity of the two-cycle processes, especially with separated furnaces and generators; and, in addition, the separation of dust, rendered possible by the fact that the generator gas is greatly cooled before entering the furnace, is "highly useful for the gas production."

As is known, the patentee continues, this dust carried by the gases from the generator continually causes trouble in the working of gas-retorts, as it interferes with the regular heating, by obstructing the tuyeres and attacking the building-material. For this reason gas-retorts must be kept idle from time to time for cleaning purposes. Though these inconveniences could be put up with to a certain extent, with the old-fashioned retort-furnaces, the separation of dust is absolutely essential to the working of the modern large chambered retorts; otherwise the exact regulation of the heating of the large heating surfaces is quite impossible.

Attempts to separate the dust have been made within the scope of the old-fashioned arrangement; but they only succeeded to an imperfect extent owing to the necessity of retaining the sensible heat of the gases. The present invention enables the dust to be separated from the gases without any such restriction, the heat of the gases having been previously utilized.

The inventor says he is aware that in connection with the manufacture of producer gas it has been proposed (patent No. 22,020 of 1898) to cool the gas for the purpose of separating bye-products therefrom, use the heated air in the producer, and pass the gas through a recuperator; and his present invention is solely concerned with the operation of distilling apparatus—its object being to prevent the choking of the flues with dust.

In carrying out the invention, the generator gases may first be used for generating steam, whereupon the dust is washed out of them, and the cooled and dust-free gases then enter the apparatus for the recovery of heat. The air may be heated by means of the heated washing water, and saturated with moisture, and then enter the gas-generator together with the steam. As the quantity of steam is always considerable (some kinds of coke requiring 1 kilo. of steam per kilo. of coal), the greater part of the heat of the generator-gases is by this means recovered. If this steam were separately produced, the fuel employed therefor would, of course, be additional to the external firing. As compared with a total of from 15 to 25 per cent. of external firing, the proportion is reduced to about 10 per cent. by the present invention.

Besides increased economy, another important advantage is said to be obtained by substituting, in connection with gas-retorts, for the old-fashioned recuperators, the single-chamber heat-accumulators (regenerators) "already highly developed in the glass and iron industries." With parallel currents of gaseous fuel and products of combustion in two-chamber heaters, there is a constant intermingling, due to inevitable leaking, which causes various troubles. But this disadvantage is removed by the alternate working of the chambers in heat-accumulators.

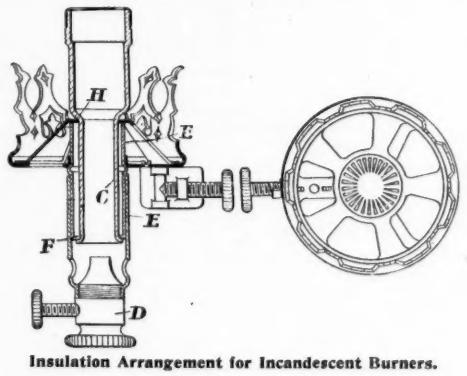
It has, further, always been observed, in practice, that the refractory material of two-chamber heaters tends to become soft when continuously heated; but this disadvantage is, it is claimed, obviated in regenerators in which there is always a period of rest after the most intense heating, when the current is reversed, about every half-hour.

Incandescent Gas-Burners.

DEUTSCHE GASGLÜHLICHT AKTIENGESELLSCHAFT (AUERGESELLSCHAFT), of Berlin.

No. 23,722; Nov. 8, 1910. Date claimed under International Convention, June 4, 1910.

In patent No. 27,869 of 1909, an upright burner for incandescent gas-lights was described, in which the tube carrying the burner crown is inserted in the nozzle-tube, and is separated from it by an insulating layer of solid material which is a bad conductor of heat. According to the present invention, the insulation between the nozzle-pipe and the inset-tube may be effected by a column of air—also a bad conductor of heat—so arranged that the cylinder gallery is at the same time separated from the inset-tube by the air column.



Insulation Arrangement for Incandescent Burners.

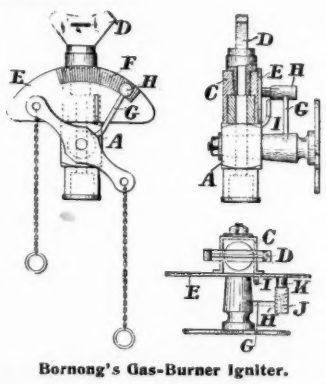
The tube E, to which the cylinder gallery is attached, is inserted in the tube which is screwed on to the nozzle D. In the tube E, the inset-tube C is fixed, in such a way that the unavoidable connection of the two tubes is formed only at the top and bottom at F and H; but otherwise there is created an air-space between the tubes. As there are only quite small points of contact at the junctions, "the conduction of heat from the tube C to the tube E is reduced to the minimum amount, and the accumulation of heat in the tube C and the preheating of the mixture of gas and air is attained in the same way as though there were between them a layer of a solid heat-insulator."

Igniting Tap for Gas-Burners.

BORNONG, M. P., of Soissons, France.

No. 27,154; Nov. 22, 1910.

This invention refers to an automatic arrangement by which the ignition of the gas at the burner is effected by the manipulation of the tap, which is provided with an arm on the plug having a socket containing a piece of magnesium-aluminium or cerium, which is adapted, when the plug is turned, to rub against the roughened or ribbed surface of a sector-shaped non-rotatable plate fixed on the body of the tap. Sparks thus produced light a bye-pass flame, which, in turn, ignites the main gas at the burner.



Bornong's Gas-Burner Igniter.

The part C is screwed to the upper part of the body A, and is surmounted by the burner D, which is provided with a plate E in the form of a sector, and having a roughened or ribbed surface F. A rod G is fitted to the tap and carries a socket H containing a piece of magnesium-aluminium or cerium K, which is pressed against the roughened surface of the plate E by a coil spring J. A tube I (with an air inlet constituting a bunsen burner at the moment of manipulating the plug of the tap) introduces a small jet of gas, which is ignited by the spark produced at the same moment owing to the friction of the magnesium-aluminium on the roughened plate. The flame occasions the instantaneous ignition of the burner; and when the key of the tap has reached the end of its course, the ignition flame is extinguished, owing to the arrangement of the tube I, which corresponds to a special opening of the body of the tap and only permits the passing of a very small jet of gas at the actual moment of ignition.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Publicity and Special Purposes Committee.

SIR,—With reference to the Conference which is to be held in accordance with the circular issued on the 6th inst., we should be much obliged if you would announce in your next issue that it will take place on Monday, the 10th of April, at the Institution of Mechanical Engineers, Storey's Gate, Westminster—the President, Mr. Alexander Wilson, taking the chair at 3 p.m.

W. T. DUNN, Secretary,
Institution of Gas Engineers.

39, *Victoria Street, S.W.*,
March 25, 1911.

The Carr-Nairne Jet-Photometer.

SIR,—I am loth to disturb "the sweet uses of advertisement," but, alas, "there is nothing new under the sun," and the combination of a small purifier with the Lowe jet was in use by myself and my then assistant (Mr. Kent) at the Wapping works of the Ratcliff Gas Company in the sixties.

Similar combination with the valued Harcourt sulphur test lamps at Wapping and Stepney and Poplar were in constant daily use in the seventies and eighties by Mr. Greville (whose helper Mr. Nairne was subsequently), and I suppose are there still.

Like pressures, hourly sends-out, illuminating power at various stages, and all impurities at the same points, it was my rule to have constant (almost hourly) records throughout the many years of anxious, weary vigilance rendered necessary by the senseless sulphur, ammonia, and other penalties now, thank goodness, abolished. Whoever contributed the information on which your article was based was most unfortunate.

In a number of other so-called inventions I have reminiscences of anticipations which existing plant and living persons can attest, and some day I may give you, if worth while.

Palace Chambers, Westminster, S.W., March 26, 1911. H. E. JONES.

[We heartily welcome the suggestion made in the last paragraph of our correspondent's letter, and shall look forward to an early publication of his "reminiscences of anticipations" for the benefit of the younger race of gas engineers.—ED. J.G.L.]

Wrought-Steel Pipes.

SIR,—In the abstract of Mr. M'Carthy's paper, on "Steel Pipes," which appears in your issue of March 21 (p. 842), the author is reported as saying that the question of the life of steel pipes had long exercised the mind of engineers, and had been the subject of much conjecture, owing to the fact that there were no data on which to base a rule. All that could be said, he went on, was that the oldest and best-known steel pipe lines were, so far as could be ascertained, in as good a condition and as free from corrosion now as when they were laid.

The ideas expressed seem to be so wide of the mark that I think it would have been as well if Mr. M'Carthy had made inquiries before uttering such statements. In support of the suggestion that steel main is only safe when it can be painted every year or so, I would refer you to a report by a Committee of Experts to the West Australian Government (1910), on the prevention of corrosion in steel mains.

During the year 1909, the West Australian Government instituted an investigation to determine the best methods for checking the corrosion which was taking place in the steel mains of the Coolgardie Water-Works—a system of supply by which about 4 million gallons of water daily can be pumped from an impounding reservoir on the Helena River through some 350 miles of 30-inch steel lock-bar pipe to a service reservoir at the Coolgardie goldfields. About two-and-a-half years after the works were completed, trouble commenced, caused by both internal and external corrosion in the steel mains, and a Committee, consisting of the late Dr. George F. Deacon, Sir William Ramsay, and Mr. Otto Hehner, was appointed to investigate the causes of the deterioration and recommend measures for its prevention.

Two factors were found to have brought about external corrosion—namely, (1) deterioration of the protective coating; and (2) the fact that the pipe was buried in trenches when it should have been carried on trestles, out of contact with the surrounding soil, the salts of which give rise to corrosion when moisture is present. Had the pipe been laid above ground, as recommended, the external corrosion, as influenced by the soluble salts contained in the soil, would, according to the report, have been entirely done away with; the coating could at all times have been repaired readily; and the detection and stoppage of leakage have been easily attended to. The pipe was, however, laid in the ground with the exception of certain lengths. The method now employed for dealing with external corrosion consists in scraping off the old coating, and applying a new one, composed of bitumen and tar. When possible, the pipe is left exposed; but when this is impracticable, a wrapper of tarred hessian is placed around the pipe. The Committee approved of these measures, and suggested further that, before filling in the trenches, the pipe should be laid on a cradle of lime concrete—a layer of slaked lime $\frac{1}{2}$ inch thick being spread over the top. This lime, according to the report, would entirely prevent further corrosive action, should the coating be damaged and moisture obtain access to the pipe.

Internal corrosion had also occurred, brought about by the failure of the protective coating—direct contact being thus allowed between the water and the steel. Attention was first drawn to the possibility of internal incrustation or tuberculation due to corrosion, by the increase in pumping head at No. 7 Station in the early part of 1906.

An examination of a number of pipes which had been removed from various sections of the main, showed conclusively that the increase in frictional resistance was a direct measure of the extent of corrosion. On the sections where friction was least, tuberculation was least;

and where friction was greatest, tuberculation was also greatest. The tubercles were formed from the corroded metal; and, consequently, the larger the tubercle the greater the corrosion. Even under the smallest tubercles (not larger than peas), a small pitting of the metal was found. As the tubercle increased in size, pitting increased in depth and area; but there appeared to be a critical depth—viz., about ⅛-inch—beyond which no further penetration took place. The corroded area, however, kept on extending until it merged into, and became confluent with, the corrosion under the surrounding tubercles.

This critical depth was an extremely important factor in the life of the main, as it was anticipated that ultimate failure would result from isolated internal pittings and not by the weakening of the plate from general corrosion. Pittings of the plate to the depth of ¼-inch were quite common; but never in all the pipes personally examined or reported on by the district engineers had a greater depth than this been observed. Although this critical depth has not been specifically commented upon in the literature on the subject, pittings to the depth of ⅛-inch are frequently referred to; but it is rarely stated that pittings of a greater depth have been noted.

Steel pipe is naturally limited to a thin shell, on account of its great strength, weight, and cost. It is easily attacked by salts and acids, both on the inside by the water flowing through it, and on the outside by the material surrounding it. A slight deterioration in so thin a shell means a great loss in strength; and the life of a steel pipe is, therefore, limited to a few years, depending upon the nature of the material in which it is laid. Experience has shown that in alkali ground in Southern California, the life of a sheet-steel pipe is short. The life of the pipe may be lengthened by a coating, both inside and outside, of asphaltic material. The coating is applied by dipping the pipe into a hot bath of the asphalt mixture. If this dipping is not carefully done at just the proper temperature, it is not likely to add much to the life of the pipe.

Internal corrosion, though slower than external, is more uniform and insidious, and was found to extend throughout the whole length of the main from the reservoir to Kalgoorlie, and it was to be expected that, after their first appearance, rust holes would increase rapidly.

March 24, 1911. ONE WHO KNOWS.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Felixstowe and Walton Water Bill.

Bills reported: Ashborne and District Gas Bill, Chesham and District Gas Bill, Ely Rural District Water Bill, Hastings Corporation (Water and Finance) Bill, Swinton Urban District Council Bill, Warrington Corporation Bill.

Bills read the third time and passed: Luton Water Bill, Slough Urban District Council Water Bill.

Last Tuesday, it was resolved to refer the Thames Conservancy Bill to the Joint Committee on the Metropolitan Water Board (New Works) Bill; and to appoint a Committee, to be named by the Committee of Selection, to act with a Committee of the House of Commons to consider the Bills. Next day, the names of the Earl of Lytton, Viscount Gough, Lord Kintore, and Lord Marchamley were submitted to the House and agreed to.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Luton Water Bill, Slough Urban District Water Bill.

Bills reported, with amendments: Bicester Urban District Gas Bill, Blackburn Corporation Water Bill, Chichester Gas Bill, Gaslight and Coke Company Bill, Marple Urban District Council Gas Bill, Weston-super-Mare Gas Bill.

On Friday, the Thames Conservancy Bill was referred to the Joint Committee of the Lords and Commons on the Metropolitan Water Board (New Works) Bill; and it was resolved to appoint four members to serve on the Committee.

The Chasetown Gas Bill, West Cheshire Water Bill, and Wirral Water Bill have been referred to a Select Committee, consisting of Sir Charles Rose (Chairman), Mr. W. G. Nicholson, Major Henderson, and Mr. Beck; to meet next Thursday.

CHESHAM AND DISTRICT GAS BILL.

The alterations in this Bill, as agreed upon between the promoters and the Urban District Council, who had entered an opposition, were intimated to the Select Committee of the House of Lords last Tuesday. The Bill came before the Committee on the 15th inst. (*ante*, p. 858); and it was then stated that an agreement had been arrived at. The proceedings were accordingly delayed for the adjustment of the alterations. The Urban District Council sought the insertion of a clause authorizing them to purchase the undertaking on the usual terms. This the Company agreed to, providing the Council promoted a Bill next session. Another important alteration made in the provisions of the Bill was in regard to the standard price, which the Company have now reduced from 4s. to 3s. 9d. A slight reduction has also been made in the amount of additional capital for which authorization is sought.

Mr. W. J. STANDRING, Solicitor to the Company, formally proved the preamble; and Mr. WILLES JOHNSON, Agent for the promoters, informed the Committee of the amendments which had been effected in the Bill.

GASLIGHT AND COKE COMPANY'S BILL.

This Bill was before the Committee of the House of Commons on Unopposed Bills last Thursday. Mr. EMMOTT presided; the other members present being Mr. WHITLEY, Mr. G. H. ROBERTS, Mr. HILLS, and Mr. ERNEST MOON, K.C. (Speaker's Counsel).

Mr. HAROLD BROWN (Parliamentary Agent) said the principal object of the Bill promoted by the Gaslight and Coke Company was to authorize the acquisition by the Company of the undertakings of the Barking and the Chigwell, Loughton, and Woodford Gas Companies. Broadly speaking, the effect of the Bill was to secure to the shareholders of the Companies whose concerns were to be acquired practically the same income as they had been receiving from the securities they now held. The Gaslight and Coke Company had an area which to a large extent was already developed; and they were beginning to feel the need of a district in which to expand their business. They possessed a considerable amount of producing plant; and they desired this surplus plant to be used. In the districts of the two other Companies, if the Bill passed, there would be an immediate reduction of 2d. per 1000 cubic feet in the price charged to private consumers, and a very large reduction in the cost of gas for public lighting. In addition, there was the obvious advantage in the way of security to the shareholders of the two Companies that they would be partners in a very much larger undertaking than the concerns in which they were now interested.

Replying to Mr. Whitley, Mr. BROWN said the present price in the Barking district was 2s. 11d. per 1000 cubic feet. This would be reduced immediately the acquisition was completed to 2s. 9d. The present price of the Gaslight and Coke Company north of the Thames was 2s. 7d. After two years, the price in the Barking district would be reduced to this figure, or whatever might be the price then charged. In the Chigwell Company's area, the price was 3s. 2d., against the Gaslight and Coke Company's 2s. 7d. It was felt that it would be too much to lower the price at once by 7d. It was proposed therefore to lower it to this figure at intervals. The Bill had been most carefully scrutinized by the local authorities, who were thoroughly satisfied. One clause proposed to get rid of £130 of preference stock which had hitherto had to figure in the accounts year after year, by converting it on liberal terms into ordinary stock.

The CHAIRMAN: Why don't you buy it up?

Mr. BROWN replied that the holders would not sell. They were giving them £250 of ordinary stock for each £100 of 5 per cent. preference stock. This meant something like 12 per cent., as against their present 5 per cent. Clause 36 was substantially a Model Clause. It authorized the Company to create a special purposes fund. They had proposed that the insurance fund, the existing fund, should be transferred to the special purposes fund at any time the Directors decided to avail themselves of the powers of the clause. On the suggestion of the Speaker's Counsel, however, they had altered the clause so that it now corresponded exactly with the Model Clause in this respect. Immediately on the passing of the Bill, therefore, the insurance fund would be transferred, and would form for the time being the special purposes fund; the Directors having the right to add to it by annual appropriations if they thought fit.

Mr. MOON: What about the carry-over in connection with it?

Mr. BROWN: With regard to this, the provisions of clause 36 came under the very close and careful scrutiny of the London County Council; and they pointed out that the power to appropriate annually 1 per cent. of the paid-up capital of the Gaslight and Coke Company was a very large amount to authorize the Directors to charge as working expenses, and, similarly, that the one-tenth part, as provided by the Model Clause, of the paid-up capital would represent a very large maximum for the fund. At their instance, it was agreed that these amounts—the 1 per cent. annually and the one-tenth as the maximum of the fund—should be halved. This arrangement was made with the full knowledge on both sides that the powers of the Gaslight and Coke Company with regard to the carry-forward from year to year is not in any way limited. The Company therefore felt free to agree to the reductions proposed. With reference to the point of the Model Clause limiting the carry-forward, the effect of the clause, taking it in the form of the Model Clause, would be rather to hamper the Company, in consequence of the agreement they made with the London County Council. The Model Clause limits the amount to be carried forward to one year's dividend. There are certain obvious advantages in the Company having considerable powers to carry forward money. The fund is available for temporary purposes requiring the expenditure of money and so on. We should prefer, if possible, to remain under the conditions accepted by the London County Council—namely, that we should not be put under any restriction with regard to the amount of the carry-forward. I suggest that the matter having been under the eye of the County Council, and that body being particularly vigilant in regard to gas matters from the point of view of the consumer, we should remain as we are without the Model Clause, and with unrestricted power as to carry-forward.

Mr. WHITLEY: But still getting advantage of the Special Purposes Fund?

Mr. BROWN: Yes.

Mr. *Corbet Woodall*, in reply to Mr. MOON, said the position was that the Model Clause had been departed from at the instigation of the London County Council, and the amount which might be set aside for the special purposes fund had been reduced from 1 per cent. to ½ per cent. At the same time they had not the limitation usually put in Bills, in which the special purposes fund was allowed, limiting the carry-over to one year's dividend on the capital of the Company. In an interview with the County Council, at which they went very fully into the details of these financial matters, the Company were under the impression that the 1 per cent. meant 1 per cent. on the whole capital of the Company; and he thought that the County Council were under the same impression. This would have meant £2,800,000, which was a large sum. But the expression in the Bill "on the paid-up capital," to which the Company agreed, would reduce the 1 per cent. by half—to £1,458,000 as a total. There was a distinction between premium capital and paid-up capital. The amount paid-up was £10,250,000,

and the amount added on conversion was £12,500,000, so that the total was nearly £23,000,000.

Mr. WHITLEY: Writing-up is not covered by the term "including premiums" in the clause?

Witness: It is not.

That is rather a nice legal point?—Premiums are paid in cash, and are applied to the purposes of the Company.

Mr. MOON remarked that the phrase was added to exclude any extra sum added on conversion.

Witness said another point was whether "paid-up capital" included debentures and debenture stock. His impression was that it ought to do; and in his own practice he had always regarded it as doing so. Reserve funds of the companies he advised had been built up on this supposition. He believed, however, it was open to question.

Mr. MOON: A lawyer would tell you it was not open to question. He would tell you capital meant capital, not something you owed.

Witness said he was particularly anxious that there should not be any misunderstanding, especially between the local authorities and the Company. If the debentures were shut out, the amount they would be allowed to place in the special purposes fund would be £562,000. They had already in the insurance fund £468,000. There was not, therefore, very much in it.

Mr. MOON: There is a great advantage in the special purposes fund clause, as compared with the insurance fund clause, because you can only use the insurance clause in special emergencies, and the special purposes fund can be used to replace dead capital,

Witness: To replace dead plant; yes. And you see the carry-forward is applicable in the same way.

Mr. MOON: I agree.

Witness: If the carry-forward were limited to one year's dividend, it would amount to £1,000,008. We can now carry forward an unlimited amount. The expression in the Acts is that anything over the money necessary for the payment of dividends shall be carried forward as an undivided balance to the next year. This has been carried forward until at present it is something like £650,000. This is now our working capital. At present, we have not, I believe, £200,000 on deposit. The whole of the carry-forward, or the greater portion of it, is used for the purposes of capital; so that whereas in 1903 we wanted capital, and Parliament gave us only £750,000, we have not touched any of it.

You may invest your special purposes fund in the undertaking of the Company. You cannot invest the insurance fund in the undertaking?—That is so. What I was going to ask was that, instead of one year according to the Model Clause, we might have the equivalent of two years in the carry-over clause.

What is your total capital?—Including conversion, about £29,000,000. I will give an illustration of the need that might arise. I was talking to our Accountant the other day; and he pointed out that if the net price of coal were the same this year as it was, if I remember rightly, in 1901 or 1902, we should need £800,000 to make up the deficiency. At the time, the net cost of coal was 11d. per 1000 cubic feet of gas; to-day it is 3d. Every penny per 1000 cubic feet means £100,000; so that the difference would be £800,000 in the mere net cost of coal. It was a year which is not likely to recur, because it was one of high-priced coal and low-priced residuals. As a rule, we get the advantage in residuals when the cost of coal is high. I mention this as showing how large the figures are that have to be contemplated in dealing with these allowances.

Mr. WHITLEY: Do you not think you have a freer hand under your present powers, including insurance fund and carry-over, than under the new Model Clauses?

Witness: No; I think not. The Speaker's Counsel took great care over the special purposes fund, and we saw advantages in it. I think it is a most valuable fund. But if it is whittled-down to so small an amount, I would rather stay where we are, unless we have security with regard to the carry-forward—unless we have two years.

Mr. BROWN: A certain equilibrium is established between the Model Clauses with regard to the carry-over and the special purposes fund?

Witness: That is so.

Mr. BROWN: You are not at present proposing to be subject to the carry-forward clause; but, if you are, in order to maintain the equilibrium that the Model Clauses has established, having cut your special purposes fund down by half, you ought logically to raise your carry-forward fund by doubling it.

Mr. WHITLEY: The extension of the carry-over clause (two years instead of one) would be, roughly, to undo what the County Council think they have gained.

Witness: At present we have no limitation at all, and the Council know it. They did not propose to put any limitation on the carry-forward. The Speaker's Counsel proposes to put a limitation on it now. This special purposes fund is made up of a distinct charge against the working expenses of the half year. It is taking so much directly out of the profits of the half year and reducing the apparent profit. The carry-forward is not. I think I may point to the story of the Company during the last five or six years. Whenever we have seen our way to a reduction in the price of gas, we have made it. We have returned about £500,000 off the price of gas in about six years. We know our interest lies in supplying gas as cheaply as we are able. There is no disposition to keep the price up to get increased profits.

What is the amount of the existing insurance fund?—£190,000.

And the amount of the special purposes fund?—Granted that we cannot regard debentures as representing working capital, it would be £562,000. It becomes really a very small thing indeed for the purpose for which it is designed.

Mr. MOON: It is better for you to have floating capital than to raise fresh stock—it is cheaper for the consumer?

Witness: Quite so.

Mr. MOON: Of course, there is the departure from the Model Clause in that the 1 per cent. has been reduced to ½ per cent.

Mr. HILLS: At present you have power to increase your carry-over until you have carried forward two or three years' dividends?

Witness: Yes; there is nothing to prevent that.

The fact that you have unlimited power to carry over means that you are not under the usual necessity to reduce your price, and you can provide for emergencies by an increase of carry-over?—Yes.

Mr. WHITLEY: I am inclined not to put in the carry-over at two years, but leave it alone.

Mr. MOON: It is not a matter on which I wish to express an opinion, because I am an interested party; but I should demur to the Model Clause being followed as regards the special purposes fund and not as regards the other. Here there is a departure by reducing the sum from 1 per cent. to ½ per cent., and therefore it does not constitute a precedent if we alter the carry-over clause too.

Witness: It is not a question of amount, but of principle.

Mr. HILLS: I agree that you cannot alter one and leave the other.

The CHAIRMAN: Then you do not want it put in. Very well, then we can go on.

Mr. *Woodall* then gave formal evidence in support of the preamble, and the Bill was allowed to proceed.

ENFIELD GAS BILL.

House of Lords Committee.—Wednesday, March 22.

(*Before Lord* SOUTHWARK, *Chairman*, *Viscount* FALKLAND, *Lord* GWYDYR, *Lord* WILLINGDON, *and Lord* DE MAULEY.)

In this Bill power is sought by the Enfield Gas Company to raise additional capital, acquire lands, and for other purposes.

Mr. R. P. BLENNERHASSETT, K.C., appeared for the promoters; and Mr. TYLDESLEY JONES represented the Middlesex County Council, who, among other things, sought a reduction of the capital asked for, and a protective clause in regard to roads and bridges.

Mr. BLENNERHASSETT, in opening, stated that the Company was incorporated by the Enfield Gas Act, 1867. It was amalgamated with the Ponders End Gas Light and Coke Company under an Order of 1879, and the powers were further extended by the Enfield Gas Order, 1883, and the Enfield Gas Act, 1898. The opposition to the present Bill seemed to be very slight. The district was a rapidly growing one; and the sales of gas were so increasing that an addition of capital was necessary if the Company were to carry on their works. This appeared from the figures, which showed that the gas sold had risen continuously from 87,081,000 cubic feet in 1898 to 217,412,000 cubic feet in 1910—an increase of over 160 per cent. If they looked at the population, it would be seen that the number of houses, according to the rateable value of the District of Enfield, showed a very considerable increase. There was a large and rapid increase in every respect. The authorized capital of the Company was £179,405. Of this had been issued, in consolidated ordinary stock, £138,337, and in consolidated preference stock £26,325—making, in all, £164,662. This included £11,057 received from premiums, on which no dividend was payable, and left still to be issued £14,742 of ordinary capital. The Company had borrowing powers for £36,500. These had been exercised to the extent of £30,500; leaving £6000 which might still be borrowed. The total capital issued therefore amounted to £195,162, of which £31,405 was nominal increment due to the conversion and consolidation of the shares into 5 per cent. stock under the Act of 1898. The balance of capital unissued was £20,742. Against this, as the sum over-expended on capital account, was £15,387. The Company were about to issue new ordinary stock to the amount of £10,000. The Bill provided for additional capital of £100,000, and power to borrow up to one-third of this—namely, £33,300. There was also an increase of borrowing powers in respect to stock already issued, to an extent of one-third. This would give them £23,302; making the total new capital £156,635—sufficient to provide the necessary capital for the Company for 13 or 14 years to come. Of the £156,635, the capital requirements were £146,600; the engineer's costs, &c., being £10,000. This £146,600 did not include the £15,000 over-expended. The Bill was practically unopposed; and he gathered that his learned friend was not seriously raising any question against the proposal to get new capital.

Mr. TYLDESLEY JONES: It is excessive, that is all.

Mr. BLENNERHASSETT (continuing) said there were one or two questions which would have to be dealt with. The first point arose on clause 28, which related to the supply of gas to a consumer who had a separate supply. The point was raised in the report of the Local Government Board. Clause 28 provided that a person who had already a separate supply must pay to the Company, previous to getting a supply from them, a minimum sum. The Local Government Board report made the following comment on the clause: "This is an exceptional clause in regard to the supply of gas. Clauses on the subject were allowed in the Rhondda Urban District Council Bill, and the Exmouth Gas Bill of last session; but similar clauses were disallowed, or else withdrawn, in the case of the Bristol and Great Grimsby Gas Bills." The state of things which it was proposed to meet was this: Where a gas consumer had a separate supply—say, of electric light—he sometimes wished to have gas also in case the electric light failed, and so guard himself against any possibility of inconvenience. Supposing the electric light did fail, a very great burden would be at once thrown upon the Company's supply; and it was necessary to have extra plant and provision made so as to be able to cope with the demand. This entailed considerable expense. While they were perfectly willing to give such a supply when demanded, they thought that, it being really of the nature of an insurance to the consumer, it was perfectly reasonable that the consumer should pay for his extra safety, and that the Company should not be obliged to incur the extra expense without an adequate return. The Local Government Board expressed no opinion at all against the Company's proposal; and there was the fact that in two Bills—one last session—this power which the Company sought was given. He might say that the clause had been discussed with the authorities of the House; and they saw no objection to it. The only opposition was that of the Middlesex County Council. They objected to the laying down of pipes for ancillary purposes. This was not a new power that the Company sought. In the Company's Act of 1898, the question was dealt with. It was a most minute and infinitesimal point. The 1898 Act clearly entitled them to use existing pipes for the purpose of conveying various materials; and he thought it could be argued that it was sufficient also to entitle them to lay down pipes for the same purpose. The object of the clause was

to do away with the ambiguity, and make it quite clear that the Company were entitled not only to use existing pipes, but to lay down new ones for ancillary purposes. They thought they had the power at present; but they wanted to clear away the doubt. There could be no valid objection to this; and so far as the public and the County Council were concerned, it was clearly in their interest that oil and the other objectionable materials should be taken underground. Petitioners asked for special protection for the main roads and bridges in their area. He submitted that the protection which was good enough for the rest of the country, as provided by the general law, was sufficient for the petitioners, and that there was nothing in the circumstances of the case to justify "special and exceptional" protection. Many Bills could be produced as precedents no doubt; but in 99 cases out of 100 the clauses inserted were simply concessions made by the promoters to put an end to opposition. The only precedents that ought to weigh were those cases in which the point had been fought out, and a decision given by a Committee on the actual merits of the question. The petitioners also asked that the Company, in return for the privilege of using the Council's roads, be required to provide gas in the Council's schools at a price agreed upon, but not exceeding 2s. 3d. per 1000 cubic feet. This was a very cool request. They asked that they should be supplied with gas at a lower price than other consumers. The Council's claim was really that a portion of the cost of education—that portion which was applicable to the use of gas—should be borne, not by the ratepayers in general, but by one particular section of the community—namely, the consumers of gas. The ordinary price of gas was 3s. 1d., and they were asking to have it at 2s. 3d. He submitted that no distinction whatever could be made in this way between schools and the ordinary consumers.

Mr. *C. W. Offord*, the General Manager and Secretary of the Company, in reply to Mr. BLENNERHASSETT, said that the Company were fairly large ratepayers. Their standard price was 4s. 6d.; and the standard rate of dividend was 5 per cent. The Company did not consider they should be asked to supply the schools at the rate at 2s. 3d. The County Council saw that the Company paid rates for everything in respect of which they could be called upon to pay. He was not aware of any exceptional circumstances which required a special protective clause in regard to the Council's roads and bridges.

In cross-examination, witness demurred to the suggestion that Parliament granted special protection to the road authority in nearly every case. He agreed that occasionally Parliament did so; but it was not the usual practice. With regard to the laying of pipes for ancillary purposes, the General Act did not give the Company power to carry oil and tar; and they sought to extend the powers of the general law in this respect. In 1898, they got an extension of the general law in regard to ancillary purposes; and they wanted a further extension now. He objected to the Company having to remove or support pipes of their own affected by the reconstruction of a bridge. Parliament had decided both ways on this question. He also objected to a requirement of 14 days' notice to the County Council for the repair of service-pipes, as being too long. The reason he objected to the Road Authority being given an opportunity of requiring the Company to maintain the pipes was because such a provision in the Bill would place the Company in the power of the Road Authority. He did not agree that the County Council as the education authority might legitimately claim the discount usually granted to large consumers in respect of their schools. The one service would not supply all their schools.

Mr. *Arthur Valon*, examined by Mr. BLENNERHASSETT, said that in his view the capital proposed to be taken under the Bill was a necessary and proper amount, having regard to the requirements of the district. He estimated that the money asked for would carry the Company on for about thirteen years. Where there was a stand-by supply, it was reasonable that the person who had it should indemnify the Gas Company against any loss. He had read the petition of the Middlesex County Council; and he thought the clauses in the General Act were quite sufficient for their protection.

Mr. BLENNERHASSETT: I do not know whether my learned friend is going on with the preferential charge for schools.

Mr. TYLDESLEY JONES: I am not going to press for a special price. I shall press for the county being treated as one consumer with regard to schools—that is all.

Mr. BLENNERHASSETT (to witness): You have heard that the County Council ask that the county shall be treated as one consumer, and get the benefit of discounts given to large consumers. In your view, is this a usual or proper course to take?

Witness: The reason for giving discounts to large consumers is that where a certain amount of gas is consumed through one service there are certain charges which are less in that case. The charge, for instance, for collection and for keeping the accounts, and so on, would depend really upon the number of accounts, and not on the amount of gas consumed; so that where you have a large amount of gas in one account, you can reduce the charge. That is the principle on which the discount is given. If you have a large account made up of four, five, or six different items, the expense to the Company is just the same as if there were that number of different accounts; and consequently there should not be the same discount in that instance as in the case where it was all taken from one meter. If you have four schools in different parts of the district, there is no saving more than there is in supplying four houses in different parts of the district.

Cross-examined by Mr. TYLDESLEY JONES, witness said he did not agree that the real advantage was in having one bill instead of a number. The great saving came in where there was only one service and one place to look after. It was not a universal practice to put special clauses in Gas Acts for the protection of road authorities. But in a large number of cases where there was only the opposition of a county council to a Bill, the company concerned would prefer to give clauses which the council were not, or ought not to be, entitled to, rather than face the certain expense of opposition. He could not off-hand give an instance of a Gas Act being passed in the last two years without a protective clause for the road authority; but he was sure that he could find one.

Re-examined by Mr. BLENNERHASSETT: In the Tamworth Bill the previous week, before a Commons Committee, certain clauses which the Company agreed to were put in; but those which the Company did not agree to insert, were not put upon them by the Committee. The particular clause putting the expense on the Company of moving pipes where an alteration was made to a bridge, was asked for in the case of Tamworth, but was left out of the Bill.

Thursday, March 23.

When the proceedings were resumed this morning,

Mr. *Valon*, in re-examination, stated, with regard to the petitioner's prayer for a minimum depth of pipes of 2 ft. 6 in., that an extra 6 inches would not make much difference. As to the protective clause sought, it was only reasonable and proper that the expense of altering the roads should fall upon the authority who made the alterations. The Company were under obligation to supply gas, whether they liked it or not, within certain limits; and they were obliged to lay their mains along the roads, which they had to take where they found them. If the authority wished to alter the position of the roads, it should be done at their own expense. He quoted the precedents of Llanelly Water, Slough (1910), Eastbourne, Brighton and Hove, and Exmouth. In the Eastbourne case, a clause was inserted putting the expense on the County Council; and this clause was adopted in the Brighton and Hove Bill, where the question was thrashed out before both Houses, and both declined to insert the provision asked for. In his view, it was reasonable and proper that these expenses should be borne by the road authority.

In answer to Mr. TYLDESLEY JONES, witness could not say whether it was the case that no clause was asked for in the Llanelly Gas Bill. He did not know that this year the Middlesex County Council obtained a full protective clause in the Slough Bill.

This concluded the case for the Bill.

Mr. *H. T. Wakelam*, County Engineer to the Middlesex County Council, said, in answer to Mr. TYLDESLEY JONES, that the Company's proposal with respect to pipes for ancillary purposes was an extension of the power granted under the general law. Great inconvenience was caused in practice because the Act of 1847 did not specify any time for the approval or disapproval of plans; and as it was unbusinesslike to acquire sufficient time by at once intimating disapproval on receipt of the plans, the Council proposed, in the clause which they asked the Committee to insert, that 14 days' notice should be given by the Company. This was a provision which had been agreed to in many cases. There would be no inconvenience to the Company, as service-pipes and emergency repairs were exempted.

Mr. BLENNERHASSETT said the Company were prepared to accept the provision with regard to 14 days' notice.

Witness, continuing, said another provision proposed in the clause was that there should be a minimum depth for all pipes of 2 ft. 6 in. They had had very many breakages of mains owing to the heavy loads which passed over the roads. A proper cover was absolutely necessary because of the constant breakages. The traffic on the county roads had, of course, a great deal to do with this. The county was so rapidly developing that the traffic was now enormous. Circumstances were so entirely different nowadays, that in Middlesex protection was necessary which in other places was not necessary. An extra 6 inches would probably have saved them great expenditure in the past.

The CHAIRMAN: Can you give us any illustration in the way of disaster overtaking you because of the want of these extra 6 inches?

Witness replied that on the Bath Road they would have saved a great deal of money if they had had this depth. Continuing, he said that another provision in the protective clause submitted was a proposal that the Company should bear the expense of the removal or support of any of their pipes affected by the alteration of the Council's roads or reconstruction of their bridges. At present if the Council wanted to rebuild a county bridge on which there were gas-pipes, they had to bear the expense of removing the pipes or supporting them during the work of reconstruction. This was certainly not reasonable. In Middlesex, they had constantly to widen and alter bridges; and they found it a great burden to have to bear the expense of supporting mains. The enormous increase in motor and other traffic on the roads necessitated widening schemes; and the Council were anxious to get this provision from the gas and water companies in the county. They had obtained it in a large number of cases. He did not think they had fought any.

By the CHAIRMAN: They had not fought cases on this point and been defeated.

By Mr. TYLDESLEY JONES: A similar provision had been inserted this year in the Slough Urban District Council's Bill, in regard to water-pipes. He had not found any great reluctance on the part of gas or water companies to concede this provision. Another provision which the Council asked to be inserted would compel the Company to make good any damage or disturbance to the roads or bridges. This provision was reasonable, and was necessary for the protection of the County Council and of the county ratepayers. The Council also asked that the Company should be required to keep their pipes in a state of repair, and that they should make good any damage suffered by the County Council by reason of a defect in the pipes. This provision had been already granted in the same Bill to the Great Eastern Railway Company, in respect of their bridges. They had had many leakages in the county in the course of the last twelve months. The Council further sought to be treated as one consumer in regard to the schools supplies.

In cross-examination by Mr. BLENNERHASSETT, witness said that in certain parts the mains would have to be sunk deeper than 2 ft. 6 in. He was aware that the Council had power to go before two Justices and have the depth prescribed; but they wished to have a specific depth laid down by Parliament. They had had to go to the Justices on occasions, and had had great trouble to get 2 ft. 3 in. or 2 ft. 4 in. This did not mean that they had had great trouble in establishing their case before the Justices. The present system also meant that somebody had to be on the spot watching the laying of the pipes. They had not had any dispute with the Enfield Company; but the Council wanted to get this provision here that they might be able to get it elsewhere. He did not wish to make any body a precedent; but he did wish to make this Bill a precedent.

By the CHAIRMAN: They had not had to go to the Magistrates very often, because the Companies had usually given way when the County Council disapproved of their proposals.

Lord WILLINGDON: Then they give way to you as a rule.

Witness: They have done so in most cases.

Replying to further questions by Counsel in regard to the precedents affecting the subject of the roads and bridges, witness pointed to the differences between Brighton and Middlesex. They did not propose that the depth of 2 ft. 6 in. should be retrospective; but they did wish it to apply to any existing pipe which might be affected by the reconstruction of a bridge. Asked if he could give a precedent for such a power as was asked in the provision relating to defective pipes, he said they had had so much trouble with the mains of other companies that they thought it necessary to get extra power in addition to the Gas-Works Clauses Act, the procedure of which was cumbersome—notice having to be given, and the aid of the High Court sought and damage proved. They could not say the damage was very great, yet much inconvenience to traffic was caused by leakages. Other companies in the county area had had serious breakages in the course of a year.

The CHAIRMAN asked Counsel for the petitioners whether he could supplement Mr. Wakelam's evidence in regard to the 2 ft. 6 in. The witness, he pointed out, had been unable to give any instance of loss or inconvenience in this connection.

Mr. TYLDESLEY JONES replied that his Lordship had heard the only evidence he could submit. Arguing in support of petitioners' clause, he said it was admitted that the Act of 1847 was insufficient for modern requirements. The whole object of this Bill was to supplement the Act in the interests of the Company by conferring upon them certain powers which the Act did not give them. The power to lay down pipes for ancillary purposes was not given by the Act of 1898. It was a power which gas companies in the last few years had been getting. But if he asked his learned friend for an instance of a decided case where somebody objected to this being in a Bill, he would have great difficulty in finding it. In these cases which were precedents in respect that they had not been objected to, Parliament had found that the existing code was insufficient, and had inserted protection for the road authorities. He said that the code was insufficient, and that further protection was both desirable and necessary. The points on which agreement had not been were in regard to the 2 ft. 6 in., roads improvements, leakages, and whether the Council should be treated as one consumer. The Company conceded the provision imposing upon them liability for any damage caused by disturbance to the roads or bridges. With regard to the minimum depth, unless this subsection was inserted, the Council would in every case have to get the Company to comply with their demands or take them before the Justices.

The CHAIRMAN: Would you agree to 2 feet?

Mr. BLENNERHASSETT: My contention is that it ought to be left to the general law.

Mr. TYLDESLEY JONES submitted that the County Engineer was the only person who was competent to give evidence in this matter. The Council asked that the expense entailed should be incurred without having to go on every occasion to the Justices and get 2 ft. 6 in. prescribed in each particular instance. This minimum depth was actually prescribed in the Tamworth case. With regard to road alterations and reconstruction of bridges, and the consequent moving of gas-pipes, under the Gas-Works Clauses Act the expenses of moving the pipes had to be borne by the road authority. But there was no consistent principle in dealing with cases of this sort in legislation. If a tramway company laid down tramways in a road where there were gas or water pipes, and in future the owner of the pipes wished to alter them and an additional cost was imposed upon him by reason of the presence of the tramways, the cost fell upon the tramway company. In this case, the County Council were the pipe owners and the Gas Company were the tramway company. It would be seen therefore that the principle he was contending for was embodied in the Tramways Act of 1870. This clause had been conceded over and over again by gas companies and water companies. His learned friend would say they were not precedents because they were not fought cases. If it was reasonable that the provision should be inserted in the Bishop's Stortford Gas, Slough Water, and Great Grimsby Gas Bills, it should not be regarded as an unreasonable clause in this Bill. He hoped their lordships would decide the question on its merits, because there were really no consistent precedents. One of the proposals of the Company was to put down a very substantial pipe for conveying oil and tar, instead of carting these materials. With regard to the leakages and defects provisions, they were not prepared to make any charge against the Company; but inconvenience, trouble, and expense had been caused to the County by the omission of gas and water companies to keep in proper repair their mains and pipes. As to discount, one of the important points was that the bill was collected as a whole, and was paid by one cheque. There was every reason why the supplies given to the various schools should be treated as one supply. The Company were fulfilling the most important functions in the district; and the County Council had no desire to impede the development of their business. All they desired was that the reasonable expenses of these works should fall, not upon the ratepayers, whether they were at Staines or in the area of the Company's supply, but upon the persons for whom the expenses were really incurred.

Mr. BLENNERHASSETT said it was obvious that the Council came to Parliament to arm themselves with weapons with which to attack other concerns. He submitted that, in relation to any question between the Council and the Company, adequate protection was given by the Act of 1847, in spite of the fact that circumstances had altered. If this were so, it was obviously undesirable to create precedents in a Private Act. Mr. Offord had suggested, with regard to a minimum depth, that he had no objection to 2 feet; but Counsel contended that the proper way to treat this matter was on the basis of the general law, which provided machinery in cases of dispute. This was a much more suitable way of dealing with the question than adopting the hard-and-fast rule of 2 ft. 6 in. No purpose was to be served by tying the hands of the Justices and involving the Company in extra cost. He asked their Lordships, as a matter of serious principle, to say that the provisions of the General Act were quite sufficient. With regard to the roads and bridges alterations, could anything be more unreasonable than that the County Council should call upon the unfortunate gas consumers to pay for the removal of pipes rendered necessary by the conditions of modern traffic? Surely the expense of the change should be met by the people who made the change. The Company were already heavy ratepayers to the Council; and it was most unjust and monstrous that this claim should be made against them. The Company protested against the idea that the County Council should be placed in a position of authority over them and be able to call upon them by notice to keep their own property in repair. The Council's proposal was perfectly absurd. The Company were the people to look after their own business; and they thought they ought to be masters in their own house. The Company could not consent to the proposal that they should regard the Council as one consumer in respect of different supplies. The most startling proposal of all was that these provisions which the Council wished to insert should operate retrospectively. The Council wanted them to apply not only to this Act, but to all the other Acts of the Company. Nothing could be more unreasonable.

The Committee having consulted together in private,

The CHAIRMAN announced that effect would be given only to those provisions in the Council's clause which the Company had agreed to accept. The other provisions which the Company contested they would strike out—viz.: (1) The minimum depth; (2) responsibility for expenses in the removal of pipes affected by roads and bridges alterations; (3), defects and leakages; and (4) discount as one consumer in respect of schools. They would also strike out the preamble to the Council's clause making its provisions retrospective in their operation. Subject to the amendments agreed upon, the Bill might proceed.

WESTON-SUPER-MARE GAS BILL.

The Bill promoted by the Weston-super-Mare Gaslight Company, for the purpose of authorizing the issue of further capital and the construction of additional works, was before the Unopposed Bills Committee of the House of Commons last Thursday. Mr. EMMOTT presided.

Mr. BLYTH (Parliamentary Agent) explained that in the Bill as deposited power was sought as to £80,000 of share capital, with the usual borrowing powers of one-third as much more. By arrangement with the Local Authority, the amouut had been cut down to £55,000, with the usual borrowing powers. Authority was also sought to increase the proportion of borrowed capital, in respect of capital already authorized, from one-fourth to one-third. If this were allowed, it would produce £7900. Altogether, the Company asked for £81,200 of new capital. The capital already authorized but unissued amounted to £17,900; making a total of over £99,000.

Mr. *Corbet Woodall* said the actual capital of the Company was £119,450, which included the £17,900 not issued; so that the actual capital issued was about £102,000. The rate of increase for the last nine years had averaged 4·6 per cent. compound. Assuming that the increase was at the rate of 5 per cent., the output would be doubled in about 14 years, which was the period for which powers were usually granted to gas companies. On this basis, the increase in the output would be 179 million cubic feet, for which, at a capital expenditure of £700 per million, £125,300 would be required. The Company had bought some land on which they proposed to erect further gas-works; so that they would have to face considerable expenditure for the purpose in a short time. The population of Weston-super-Mare in 1901 was just under 20,000; and it was now estimated to be about 23,000. In the summer the population trebled itself. He had had a case recently in which the consumption of gas per head had doubled during a period in which the population had remained stationary. This was a place where prepayment meters had been largely introduced. The capital expenditure on the existing works was about £700 per million cubic feet. The expenditure per million cubic feet to provide for the 179 millions of contemplated increase would be rather more. The tendency now was to spend larger and larger sums inside the consumers' premises. In some cases the internal fittings were provided by the consumers; but in these instances the increase was very small. In Weston, there was an Electric Light Company who competed with the promoters.

Mr. BLYTH stated that the Company had a maximum price of 4s. per 1000 cubic feet. The price actually charged now was 2s. 8d. The maximum dividend was 5 per cent. The ordinary capital had been converted, and, with the preference stock, bore 5 per cent. interest. The new capital was to bear 5 per cent.

Witness said that £39,000 of 7 per cent. capital had been converted into £59,000 of 5 per cent. capital. The £102,000 included the nominal addition to the capital. Thus the Company's first installation up to 179 million cubic feet had not cost £700 per million.

Mr. MOON (Speaker's Counsel): You are basing your prospective expenditure on the figure of £700 per million cubic feet; and I am wondering whether we are right in giving you as much if it turns out that up to the present it has only cost you £600.

Witness said he thought they were, because the estimate of £700 brought out the figure of £125,000; and the Company were asking for considerably less than this.

Mr. BLYTH: All we are asking for is £81,000.

The CHAIRMAN: In addition to the unissued £17,000. Very well, we will grant the capital powers asked for.

The Solicitor to the Company having proved the preamble, the Bill was allowed to proceed.

Dartmouth Gas Company.—The annual meeting of this Company was held last Tuesday—Mr. R. W. Prideaux presiding. The Directors, in their report, stated that the revenue account showed receipts to the amount of £5120; being an increase of £308 on the previous year. The expenditure was £4223, or an increase of £120. The balance carried to the profit and loss account was £897. After providing for debenture and other interest charges, the Directors recommended a dividend of 10s. per share on the ordinary shares, less income-tax; carrying forward the balance. The prepayment meters and stoves numbered 812—an increase of 43. The report was adopted.

ASHBORNE AND DISTRICT GAS BILL.

House of Lords Committee—Monday, March 20.

(*Before Lord* NEWTON, *Chairman*, *Lord* O'HAGAN, *the Earl of* WESTMEATH, *the Earl of* MALMESBURY, *and Lord* SEATON.)

Authority is sought in this Bill by the Ashborne Gas Company to incorporate the Company, increase the capital, extend the area of supply, and in other ways provide greater scope for the operations of the undertaking.

Mr. RAM, K.C., and Mr. HUTCHINSON, K.C., appeared on behalf of the Company; while Mr. HONORATUS LLOYD, K.C., Mr. J. SHAW, K.C., and Mr. MADDOCKS represented the Ashborne Urban District Council, who appeared in opposition.

Mr. RAM, in opening, said this was a Bill to dissolve the existing Gas Company and to reincorporate it under parliamentary powers. Ashborne was a town of some 1000 inhabited houses; and there were around it certain areas served by the Company. It was also desired to extend the area. The rateable value of the urban district was something over £16,000. The assessable value of the district rate was £14,400. The borrowing powers of the Urban District Council were accordingly £28,800; being limited under the Public Health Act to double the assessable value. The outstanding loans owed to-day by the Urban District Council were something over £23,000. Their Lordships would see, therefore, that there was a very considerable liability, and that the borrowing powers were pledged very nearly up to the hilt. The Council lately had spent £15,000 on a sewage scheme. The Company was formed so long ago that it was to-day a non-statutory Company; and they sought to be made a statutory concern. The Company was formed in 1840. There were 173 shares of £10 each; making a paid-up capital of only £1730. Shortly after this, the share capital was enlarged to £2330. They managed to go on with this capital supplying the district until 1859; and then, when they had been nearly twenty years in existence, they wanted more, and issued 60 new shares—bringing up the capital to £2930. Seven years later, in 1866, thirty new shares were issued by option. Every £10 share was sold then for £16 10s.; and the total amount raised was £195. In 1875, the Company was registered as a Joint-Stock Company; and so they continued until 1887, when all the old rules and regulations were rescinded by resolution of shareholders, the capital increased to £4000, and the Company registered with new Articles of Association. This increase of capital was met by creating 77 new shares. Twenty-seven of these were issued by option, at a premium that realized £276 17s. 6d. It would be seen that the capital was gradually creeping up, not only from the amount of money subscribed, but by accretions of premium from time to time obtained by the issue of the new shares. There was no need for the further fifty shares for ten years; and in 1897 they were issued at a premium, the total of which was £560. So things remained until 1902, when the Company, by special resolution, raised the capital from £4000 to £5000. In addition to this, there was £1366 of premiums at the time; and the total capital was £7366. There was a scheme of reconstruction in 1909; and the Company's undertaking, from the capital expended upon it year by year out of the annual income, had become a very valuable business, worth, roughly speaking, £20,000. Under the new scheme, each of the shareholders exchanged one £10 share in the old Company for four £10 shares in the new Company. This was the state of things to-day. Therefore, the capital was nominally £20,000, created in the way described. When the Company was first started in 1840, there was a very small business; and no dividends were paid for many years. The price of gas was then 6s. 3d. per 1000 cubic feet. This went on for some twenty years. The first dividend of which they had record was in 1860. The Company then seemed to have been in a better position because the price was reduced to 5s. 10d., and the Company were able to pay a dividend of 6 per cent. From 1860 up to 1877, there were various dividends paid—7 per cent., 8 per cent., and 9 per cent. From 1877 onwards, there had been a regular payment of 10 per cent., except during three years, 1884-87, when there was a new gasholder. They then got 7½ per cent. Although the dividends were high, there had been, of course, very large reductions of price. The price to-day was 2s. 11d. per 1000 cubic feet, brought down by discount to ordinary consumers; and to large consumers it was 2s. 5d. This was for lighting; while for power the Company charged 1s. 7d. to the District Council and other large consumers, and 2s. to ordinary consumers. These prices would be proved exceptionally low—so low that there were only five companies in England under similar circumstances who could sell gas at anything like them. These companies were situated in the midst of coalfields. The Company's output was 25 million cubic feet. No sort of complaint was alleged against the Company. They were on the very best of terms with the Urban Council. The management of the Company had been exceedingly economical. The Directors had set an example to others by taking only nominal fees. Until the last year or two, their fees, he thought, were £3 per annum. It was perfectly certain that there must be more gas made soon; and larger capital was therefore needed. Last year they were serving outside Ashborne only one place—Clifton. This venture was not yet paying; they had been serving Clifton to a certain extent at a loss. But what would make a very great difference undoubtedly was the fact that the Anglo-Swiss Milk Company were setting up a factory there, in which they would employ 250 to 300 hands, and had asked a quotation for the supply per annum of 1,500,000 cubic feet of gas. The Company asked their Lordships for power to fix a dividend of 8 per cent.; and they wanted power to raise further capital not exceeding £15,000. They also sought power to serve districts outside their area. The authorities of these districts did not offer any opposition at all. It was proposed that the limits in future should be the Urban District of Ashborne and the parishes of Clifton and Compton, which they supplied to-day, with the addition of Mapleton, Offcote, and Underwood, Stirston, in the county of Derby, and Mayfield and Okeover, in the county of Stafford. The only petitioners against the Bill were the Ashborne Urban District Council. The Company asked power to charge 3s. 6d. as a standard price inside, with the right to charge an additional 6d. per 1000 cubic feet in the area outside that in which they were selling to-day. The innuendo of the petitioners was that they had been wringing extravagant prices out of the consumers. Their Lordships would find that this was not the case. Money which the Company might easily have paid out in dividends had been put into the works. The Council asked Parliament either to reject the Bill or to oblige the Company to sell the undertaking to the petitioners. If ever there was a case in which a company ought not to be forced to sell to the council, this was such a case. If the Committee were to decide, after hearing evidence, that the undertaking should be sold to the petitioners, then they would bow to the decision. But they asked their Lordships to be quite sure of two things—first, that the petitioners did really mean to buy, and at once, and did not intend to delay matters, and meant to bring in a Bill next session; and, secondly, that the terms would be such that the Company's shareholders would be secure against loss. He called attention to the Hitchin Bill. In that case, it was a well-managed Company, who, as in this case, did not wish to sell. Their Lordships there put in a clause to say that in the arbitration the shareholders should have the 10 per cent. usually given in the case of compulsory purchase, in order to recoup them for any loss in being compelled to sell. If their Lordships thought this was a case for purchase by the Urban District Council, he asked them to safeguard the shareholders against any possibility of loss.

Mr. *E. H. Stevenson*, examined by Mr. RAM, said he had inspected the works of the Company. In his opinion, the Company had done exceedingly well for their consumers. He thought they had not considered the shareholders so much as the consumers, because they had done what was hardly ever done by a non-statutory company—issued the capital by option, and obtained a very high premium upon it. They had never paid, on the average, more than about 7 per cent. on the capital issued. This was a very reasonable return for a non-statutory company. He certainly considered this a unique case. So far as his inquiries had gone, he had discovered no complaints against the management or the prices charged. He had made a structural valuation of the undertaking, based on the capital expended by the Company as shown by the structures. The figure he brought out as actually expended on structures was £21,275. Apart from this, £1200 or £1300 was needed; and he put the balance of the valuation of £23,000 down to the cost of forming the Company in the three different stages. The value of the undertaking was there to-day, and everything was in very fair order. Nearly £7400 had been subscribed; and the balance between that and £23,000 had been found from time to time out of income. They were profits which the shareholders might have put into their pockets. Parliament usually gave 10 per cent. on the capital subscribed and 5 per cent. on that which had been expended out of revenue. In certain cases, Parliament had allowed a great deal more than this. The Company had done so well for the consumer in the past—had given the use of £2370 of capital without paying the ordinary dividend upon it, and had reduced the price so low—that he thought they should be treated generously. This was why he asked that the Company should be allowed 8 per cent. on the £20,000. The price of gas was very low. It was 3s. 4d. per 1000 cubic feet, with discounts, which varied from 5d. to 11d. per 1000 cubic feet, according to the quantity used. As compared with similar cases, the price was very low. The standard price asked for was lower than any in the district, with the exception of Derby, which had an output of 904 million cubic feet. Further capital was necessitated by the increased supply. He thought this such a case that, if their Lordships decided that the undertaking should be sold, the shareholders ought to be protected. It was really the psychological moment at which the Company could be made a good thing, and a good thing for the Urban District Council if they were allowed to purchase.

In cross-examination by Mr. HONORATUS LLOYD, witness said he did not agree that the subscribed capital of the Company was only £5000. Of the £23,000 structural valuation, £15,623 had been found out of the customers. This meant that two-thirds of the working capital had been built up out of the funds provided by the consumers in relation to the price charged by the Company for gas. On the actual capital subscribed, the Company had not paid anything like 10 per cent. at any time.

Mr. HONORATUS LLOYD: On actual script capital, they have paid 10 per cent. for years and years, and at the same time built up two-thirds of their works out of the price charged for gas, and a large reserve?

Witness: A very large part of it occurred when they were paying less than 10 per cent. The greater portion of this has borne no dividend at all.

Witness declared that the present output was not what the undertaking was capable of. It was capable of—with the exception of the gasholders—about 40 per cent. more. It was not the case that ample justice would be done to the Company if the present capital was taken at £15,000 instead of £20,000. The average price of gas charged by the Company to-day was 2s. 10·82d. Supposing they went on selling at the present price, the dividend the Company would pay, if granted a standard price of 3s. 6d., would be £9 8s., if they earned the money. He considered this fair as between the Company and the consumer, because they should be many years without earning their dividend at the present price. If ever there was a case for the 10 per cent., this was the case, because there had not been a complaint either by a consumer or anybody else. It was not the case that people had scarcely the effrontery to ask for the 10 per cent. nowadays. He had certainly heard attempts to justify it in quite recent times—it depended upon circumstances.

In re-examination by Mr. RAM, witness said new mains were required already in certain parts for the proper supply of the present district. When he talked about 40 per cent. more, he referred to the plant for manufacturing, and not to the distribution plant. The Company, having a capital of £20,000, had less capital per million feet of gas sold than the average of companies in the district. After the extension, considerable expenditure would arise on such things as slot meters and stoves.

Mr. *H. G. Harrison*, examined by Mr. HUTCHINSON, said he was Manager of the Ashborne Gas Company, and had been since 1898. Practically the whole of the plant, with the exception of the holder

and one or two other smaller parts, was then in need of renewal. New plant was introduced, and at present it was in a good state of repair and efficiency for the work required. There was room in the existing retort-house for an additional bed, and for three beds if the boilers were removed. When they started to reconstruct the works, the make was about 16 million cubic feet; and the Directors' idea was to double this capacity. The whole plant, with the exception of the gasholders, could be brought up to the one level for turning out 30 million cubic feet. Additional storage would have to be provided if any material increase took place. The maximum day's output in 1910 was 112,000 cubic feet, and the minimum 50,000 feet. About £6300 was spent on the improvements he had referred to; and in addition to this, £2300 was expended on automatic meters, cookers, mains, &c. The whole of the distributing mains were in excess of present requirements. They had an 8-inch main from the works to the centre of the district, and possibly a larger trunk main would have to be laid from the works. They had about 450 meters, 306 prepayment meters, 137 cookers, 210 free slot meters, 115 public lamps; and the whole of the plant, including the cooking and lighting appliances and distributing mains, was in good and efficient order. In 1898, the price of gas was 3s. 9d. per 1000 cubic feet to ordinary consumers, with a discount of 5d. The present price was 2s. 11d. net—3s. 4d., with 5d. discount, varying according to consumption. The average price last year was 2s. 8¼d. He agreed with Mr. Stevenson that another 2d. at least ought to be added. The prepayment meter consumer had 22 feet for 1d. There was a discount of 5 per cent. when the amount for prepayment exceeded 8s. With regard to the cost of coal, the average price in 1910 was 13s. 2d. or 13s. 3d. per ton; and cartage had to be paid in addition to this—making the average price at the works about 13s. 9d. This was fairly high. In 1905, the Company were selling 21 million cubic feet; in 1906, 21½ millions; in 1907, over 22 millions; in 1908, 23½ millions; in 1909, 23¾ millions; and practically the same in 1910. The Company always worked most amicably with the local authority.

In cross-examination by Mr. SHAW, witness admitted that during the period the Company were carrying out improvements at a cost of £8600, they paid 10 per cent. upon the capital of £5000. The capital was written-up to £20,000 on the basis of the value of the plant. He arrived at his valuation by ascertaining what it would cost to build works to make the quantity of gas they were then producing, and likely to produce with the same plant, and with the distributing plant. He put down a lump value for the undertaking as a going concern. His Directors wanted an assurance that there was a minimum value in it of £20,000.

Tuesday, March 21.

When the proceedings were resumed to-day,

Mr. *John Lister*, the Chairman of the Company, confirmed the evidence given by Mr. Harrison. The Company had always been a progressive one. In his view, the price now charged was very reasonable. In Mayfield, which would be supplied under the provisions of the Bill, there was a population of 1200. There were in the area two cotton mills, which at present made their own gas; but they had under consideration a proposal to get it from the Company.

This closed the case for the promoters.

Mr. *William Cash*, examined by Mr. SHAW, said the published accounts of the Company were not complete in the usual sense of the word; and it was somewhat difficult to find out from them what the true position was. He had prepared a table showing such information as he had been able to obtain. The share capital for the last five years was £5000, subsequently written-up to £20,000. The Company had been building up a considerable sum as a reserve fund. Practically all of this money—to the extent of £2193—was invested in Consols and India Stock. The Company were really in a still more favourable position than this amount indicated. The proposal of an 8 per cent. standard dividend meant the authorization of £1600 per annum. He agreed with Mr. Stevenson that the usual practice of Parliament was to allow 10 per cent. on the capital actually subscribed and 5 per cent. on the capital expended out of profits, subject to proof that a certain amount had actually been spent on the works. The shareholder who invested at a premium did so with a knowledge of the facts, and, roughly speaking, invested his money to return 7½ per cent. If 10 per cent. were given on the capital and premium, it would be something more, in his opinion, than was intended, or even bargained for, by the shareholder. If the share capital were taken at £5000, and the money spent on the works at £10,000, and 10 per cent. given on the former and 5 per cent. on the latter, this would work out at £1000 a year. The difference between 2s. 11d. (the net price to-day) and the standard price of 3s. 6d. was an additional £9 8s., which the Company could distribute on the capital in the Bill. On the original share capital, this would be about 37 per cent. In his opinion, the standard price should be 2s. 9d. With 1s. 8·45d. as the cost of gas, *plus* 2d. making 1s. 10½d., £1000 a year should be taken as a reasonable sum; and this would mean 10d. more, or 2s. 9d. in all. In 1909, the Company were actually paying 300 per cent. on the original capital.

In cross-examination by Mr. HUTCHINSON, witness said he meant by this that the Company had distributed three times the amount of the face value. If the proposition were set up that the Company and their consumers were in a sense partners, then he said the Company had been charging such a price over a long period as had enabled them to accumulate a sum of money which, described as the money of the shareholders, had actually been contributed by the consumers. He agreed that this was one of the best-managed non-statutory companies he had ever had to deal with, and that when a company came to Parliament under such circumstances it received very favourable consideration. Parliament, however, also had regard to the future, and were not likely to allow a capitalization and standard price which would give the shareholders an extravagant return for their money. After all, the Company were having £1000 a year, which was not a bad return. There could be no dispute about the fact that the Company's condition was a great deal more prosperous than was apparent on the balance-sheet. Nobody could say the shareholders had had a hard time getting 10 per cent. for thirty years.

Mr. *H. E. Jones*, examined by Mr. SHAW, stated that, so far as the accounts went, there was no reason shown for putting up the share capital from £5000 to £20,000. The Company had good, substantial works at present, though some of the buildings were very old and poor. No doubt a good deal of money had been spent on them. He agreed that it was time the Company came to Parliament. Had the ratepayers known anything about the profits the Company were paying, probably the Urban District Council would have been induced to take action. His structural valuation amounted to £16,146; being £10,455 on the works, and £5691 on the district. With an extra expenditure on the gasholders and mains, they would get a 32 million cubic feet works with a capital of £23,793. He agreed with the Manager that the actual money spent since 1898 had been about £8500. With regard to the standard price, 1s. was the utmost the shareholders ought to have; making the price 2s. 10d. The net result of the Bill would be to give the shareholders a very much larger dividend than Parliament allowed.

In cross-examination by Mr. RAM, witness admitted, in regard to the record of the Company, that they could not have anything better than an entire absence of complaint at this stage of their history. The coal-store was very poor. He was not aware that the land which he valued at £500 cost £1600 in 1899. He was not a land valuer, and was content to take Mr. Stevenson's figures on this.

Mr. SHAW, addressing the Committee, pointed out that from 1866 onwards the Company had been in a very prosperous condition, and had paid a 10 per cent. dividend pretty regularly. When they got to the consideration of the shareholders who "bore the heat of the day," they had to go a long way back. The Committee were asked to decide what the proper capital in the concern was, what the standard price should be, how much out of the income the Company ought to be allowed to divide as dividends, and whether the Urban District Council should have a purchase clause. He agreed that if they did not promote a Bill next year they ought not to be allowed to do so at all. They desired that the capital and standard price should be put on a proper basis, so as to deal fairly with the Company and not unfairly with the ratepayers, who had to pay the price of gas. The £5000, he contended, was script capital; and whatever was put out to reserve was not capital, but reserve. What the shareholders got was on the £5000. No doubt they knew the reserve money was there; but it was in no sense share capital. Since 1898, a sum of £8600 had been actually spent on the works; but how the Company arrived at £20,000 he did not know. Mr. Cash suggested that £1000 was sufficient for distribution in the matter of dividend, considering the whole surroundings of the case. This would give the Company their 10 per cent. on the £5000 and 5 per cent. on the £10,000. The Company's claim for new capital was practically for £20,000 or more. The Urban District Council considered this too much, because it would enable the Company to stop out of Parliament too long. The Company required only something like £10,000 additional capital, which would give them, with the borrowing powers, about £12,000. With regard to purchase, he considered the proper way was under the Land Clauses and Gas-Works Clauses Acts, and that there should be no dictation from Parliament to the arbitrator to award 10 per cent. for compulsory purchase to the Company. All they asked in the meantime was that they should have a purchase clause in the Bill, and that the Company should not oppose them on the principle of purchase if a Bill was introduced next year.

Mr. RAM argued that if ever there was a case in which the shareholders should be protected, it was here. The Company came to Parliament with the record of a blameless life; and he held that they should have not only the full price for their property, but the price of the arbitrators for being compelled to sell against their will that which they would much rather keep. He asked that, in fixing the standard price, their Lordships should impose such a margin as would safeguard the Company against loss when, as occurred every now and again, they had to pay more for coal, or incur exceptional expenditure in their works. Mr. Jones allowed them £16,446; but this did not include anything for either working capital or the expenses of formation, which were included in Mr. Stevenson's valuation of £23,000. When these two items were allowed for in Mr. Jones's valuation, the difference was infinitesimal. After making these allowances, the Committee got practically £20,000, by striking the difference between the two valuations.

The Committee, after consulting in private, decided that the preamble was proved, subject to the cutting down of the £15,000 additional capital to £10,000, and the reduction of the standard price from 3s. 6d. to 3s. 4d., and proportionately in the case of the districts outside. They would not insert a purchase clause.

CHICHESTER GAS BILL.

This Bill was last Thursday before the Unopposed Bills Committee of the House of Commons, presided over by Mr. EMMOTT.

Mr. BLYTH, Parliamentary Agent, said it was a Bill to extend the limits of supply of the City of Chichester Gas Company and to authorize the issue of further capital. Originally it was proposed to include in the limits of supply a portion of the area of the Petersfield and Selsey Gas Company. This proposition of the proposed additional area had, however, now been abandoned.

Mr. *Joseph Cash*, a Director of the Chichester Gas Company, said power was sought to raise £20,000 by shares, with the usual borrowing provision as to one-third as much. The maximum price was 4s. 6d. per 1000 cubic feet, and the price actually charged was 3s. 6d. The maximum dividends payable were 10 and 7 per cent., and dividends at this rate had been paid. The present dividends were lower. This fact was due to the competition of the electric light, which had recently been established by a Company in Chichester. They were, however, recovering their position. The Company, by existing Acts, were authorized to raise £53,000. The average rate of increase in consumption during the past five years (excepting 1910, which was affected by the competition of electricity) had been 7 per cent. per annum. The capital authorized but unissued amounted to £15,218, which, with the proposed new capital, made a total of £41,000. Assuming the rate of increase to be 7 per cent., and that the capital outlay would be at the rate of £800 per million cubic feet, the capital powers sought would

suffice for about nine years; if the rate of increase were 6 per cent., the capital would suffice for about 11 years; and if the rate of increase were 5 per cent., it would suffice for about 13 years. There was a decrease in the consumption in 1910 owing to the competition of the electric light. He had considerable experience with regard to the competition of electric light, and had had no difficulty whatever in meeting it in other towns. He was the Engineer to the Brighton Gas Company. In Brighton they had had perhaps a greater amount of competition from electricity than any other place in the United Kingdom, yet for the last few years they had had a steady increase in the gas consumption. He was sure that in Chichester they would soon overcome the small set-back they had sustained. The area proposed to be included would probably be a suburb of Chichester; and he expected a large demand for gas from it.

Replying to Mr. E. Moon (Speaker's Counsel), witness said that, in order to maintain the dividend, they were unable to reduce the price of gas.

Mr. Moon: You propose to issue the new preference capital at 6 per cent. Why is this? Five per cent. is usual.

Witness: Five per cent. is usual; but in times of stress, when money is dear, small companies cannot always float their stock at par. Being under the auction clauses, all it means is that if it is issued at 6 per cent. we shall have a larger premium than if it is issued at 5 per cent. There will be no more capital issued.

Replying to further questions, witness said they had no other preference capital. They had debenture stock raised at 4 per cent. He should say they would have no difficulty in issuing further 4 per cent. capital at par. He explained the necessity of being able to charge a differential rate in the outlying districts. There were plenty of cases, he said, in which the difference was 1s. or 1s. 6d.; whereas here the amount was only 6d. The Electric Light Company who were competing with them were seeking power in the present session to supply in the proposed additional area.

Formal evidence in proof of the preamble having been tendered, the Bill was ordered to be reported for third reading.

BICESTER URBAN DISTRICT GAS BILL.

Among the Bills before the Unopposed Bills Committee of the House of Commons presided over by Mr. Emmott last Thursday, was one promoted by the Bicester Urban District Council for the purpose of confirming the purchase of the local gas-works.

Mr. Baker (Parliamentary Agent) said the Bill as originally deposited provided for the compulsory purchase of the gas undertaking. Since then, however, an agreement had been come to with the Mid-Oxfordshire Gaslight and Coke Company, under which the Council bought the works for £4300. Bicester had a population of 3023; and a penny rate produced £45. The financial position of the town was fairly good, inasmuch as it had power, under the Public Health Act, to borrow £22,000, and had actually borrowed less than half this sum.

Mr. *E. H. Stevenson* stated that he visited the works about three years ago to value certain meters, pipes, stock, &c. The works were rather good, though small. Since then, he was informed that a new gasholder and new condensers had been provided. The works were capable of making 9 or 10 million cubic feet of gas per annum. Last year the Company sold 6,188,000 cubic feet, and the year before 5,389,000 cubic feet; so that there was an increase of 15 per cent. Three years ago, there were 223 meters out. Now the number was 354; and it would probably be greater if the price of gas were less. The price of 5s. per 1000 cubic feet was a high figure; and with the concern in the hands of the Local Authority it ought soon to be reduced. At least £8000 must have been spent on the works. The proposed price of £4300 was therefore very reasonable. The cost of erecting gas-works of this size, with meters and stoves as at Bicester, was approximately £1000 per million cubic feet. There was no question that the bargain was a good one for the town. If the Council bought on the profits, in the ordinary way, the price would be higher. As far as he could make out, the cost of the gas was 3s. 7½d. per 1000 cubic feet. He was certain it could be made here for less than this. In works which were smaller than these, gas had been made at a cost of about 2s. 3d. per 1000 cubic feet. The buildings and the plant here could not have depreciated much in three years. Most of the meters and some of the service and main pipes had recently been put in. It was not, therefore, a scrap works. Until the concern became part of the Mid-Oxfordshire undertaking, it was remunerative. It was only because there were such enormous standing charges that they could not pay their way. He estimated that the net revenue for 1909 was £325, which was a small amount for an income of nearly £2000. He thought he could more than double this. The works were originally started in 1845; but he did not think any of the 1845 parts were left when he visited Bicester. The retorts were, he thought, of the old type. If new ones were installed, they would increase the make of gas per ton of coal, reduce the quantity of coke used for fuel, increase the profit, and pay for the cost of the new retort-settings in probably a couple of years. Prepayment meter consumers were being charged 5s. 2½d. per 1000 cubic feet.

Mr. Baker said the Council proposed to continue charging at the present rate until they were able to reduce it. Their ability to reduce the price would depend on the period the Committee allowed for the repayment of the loan. The Council were anxious to reduce the price. In several similar cases, 40 years had been allowed for repayment; and he asked that this period should be granted in this instance. Power to raise £500 for working capital was sought; and for this the period was 10 years.

Replying to the Committee, witness said there was distinct goodwill in the right to supply; but it was not included in the £4300. They had got the undertaking without the goodwill.

Mr. Moon: The period is very often 30 years.

Witness: Parliament gave 40 years in the Lisburn case; and the works were not nearly as good as these.

Mr. Baker said the assessable value of Bicester was £11,400. It was estimated that the Council would have to spend £1500 on the works immediately, and for this and for all further capital they would have to go to the Local Government Board, who would certainly not give 40 years. It was more likely that they would give 25 years.

After some further discussion, the period of 35 years was fixed by the Committee.

Mr. *E. F. Tanner*, Clerk to the Bicester Council, formally proved the preamble; and the Bill was ordered to be reported for third reading.

MARPLE GAS BILL.

This Bill was before the Unopposed Committee of the House of Commons, presided over by Mr. Emmott, last Thursday.

Mr. Pritchard, Parliamentary Agent, stated that the Bill was promoted by the Marple Urban District Council with the object of obtaining authority to purchase further lands for an extension of the gas-works, and to borrow £500 for working capital and other money with which to extend and improve the gas undertaking, &c. The estimate for permanent works proposed to be erected was as follows: Purchase of land and easements, £950; new retort-house, coal-store, boiler and engine houses, chimney and boundary walls, £2000; benches and stage floor, £1840; retorts, £160; new exhauster and engine, £210; new Cornish boiler and setting, £250; removal and re-erection of existing condensers, exhausters, and connections, £180; construction of weigh-bridge, £60—total £5650.

Mr. *J. K. Law*, the Gas Engineer to the Council, stated that the demand for gas in the district had increased in the last four years by 36 per cent., and that a further increase was expected. During one twenty hours in December last, the gas made, working at their maximum, was 107,000 cubic feet; and the gas sent out in the same period was 110,000 cubic feet. This figure was often reached.

Mr. Pritchard said with regard to clause 11, that the Local Government Board pointed out that under the Council's Act of 1886 certain lands were authorized for the manufacture of gas. The Council in that year purchased the undertaking of the Marple Gas Company. The limits of supply then fixed were the urban district of Marple and three adjacent parishes. The gas-works were not in the urban district, but in an adjoining parish; and at that time their transfer to the site, in Marple, referred to in the Act of 1886, was contemplated. It was found subsequently that it was more convenient to continue the works on the existing site, and the land in Marple was not therefore used. It was now proposed to extend the existing works to an adjoining site. In regard to clause 25, the Home Office had written a letter in which they suggested that the promoters should show special circumstances before it was allowed. He pressed, however, that the clause be allowed in ordinary circumstances. It was as follows:

> Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Council a supply or the continuance of a supply of gas for premises having a separate supply—that is to say, a supply from an installation other than that of the Council—unless he shall have previously agreed to pay the Council such minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for those premises; and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in manner provided by the Arbitration Act, 1889.

The clause was allowed.

Mr. Pritchard said that by clause 29 they asked for 60 years in which to repay the money required for the purchase of land; and for 30 years for the repayment of the money needed for the extensions and improvement of the gas-works; and for ten years for the repayment of the working capital. Ten years was the period named by the Local Government Board with regard to the working capital. With reference to the other matters, no terms were suggested. The promoters had, however, discussed these clauses with the authorities of the House of Lords; and the terms mentioned were suggested by them.

The clause was accepted.

The Solicitor to the Urban District Council then gave formal evidence in support of the preamble; and the Bill passed the Committee.

The Public Lighting of the City of London.

Exceptional interest attaches to proceedings at the annual dinner of the Streets Committee of the Corporation of London, which took place at De Keyser's Hotel on the 17th inst., under the presidency of Mr. Josiah Gunton, the Chairman of the Committee, from the fact that reference was made to the public lighting of the City. The Lord Mayor (the Right Hon. Sir Thomas Vezey Strong) proposed the health of the Chairman, who, he said, had so ably discharged the obligations of the office he held that his colleagues had unanimously re-elected him; while, in further appreciation of his labours, they now asked him to accept a pair of silver candelabra as a reminder of work so well done, and many friends made and securely retained. The Chairman, in the course of his response, said he had been in most of the cities of the Continent, and in none of them were the streets better kept than those of the City of London. In regard to lighting, however, there was room for very decided improvement. The Committee were hoping to carry out a satisfactory scheme throughout the City on the lines of the centrally-hung lamps—Keith high-pressure gas-lamps, of 1500-candle power, to be seen at the east end of Cannon Street, and the magazine electric arc lamps of 2000-candle power in Cheapside. By this arrangement more than double the present lighting power would be given, and the Corporation would save not less then £3000 a year. His reason for remaining in the chair for another year was that he wanted personally to carry the improvement through. He was anxious to double the illumination of the City streets, and at the same time save money; and he was confident that the Committee would succeed in this effort.

With reference to the paragraph in the last number of the "Journal" (p. 866) in which mention was made of the Lichfield Gas Company's new mains to Hammerwich, we learn that they consist of 6000 yards of 4-inch and 1500 yards of 3-inch Mannesmann weldless steel spigot and faucet tubes.

LEGAL INTELLIGENCE.

WATER SUPPLY TO FACTORIES.

The Judgments in the Colley's Patents Case.

As briefly recorded in the "JOURNAL" for Feb. 28, the judgment of the Court of Appeal was recently given in the case of *Metropolitan Water Board v. Colley's Patents, Limited*, in which the Board appealed against the decision of the Divisional Court upholding the judgment of the Judge at the Westminster County Court, who held that the defendants were not liable to pay for the water supplied to their factory on the rateable value. In the Divisional Court, Mr. Justice Coleridge differed from Mr. Justice Phillimore; and the decision of the Court below was consequently allowed to stand. [See "JOURNAL," Dec. 27, 1910, p. 939.]

The appeal was argued by Mr. DANCKWERTS, K.C., and Mr. A. B. SHAW (instructed by Mr. Walter Moon) on behalf of the Water Board; and by Mr. C. A. RUSSELL, K.C., and Mr. M'CURDY for the respondents (instructed by Messrs. H. H. Wills and Sons). All the previous cases were cited and discussed; the chief question at issue being whether or not the present case was governed by that of the Board against the Brighton Railway Company. The Court consisted of Lords Justices Vaughan Williams, Farwell, and Kennedy; and the chief features of their judgments are indicated below. As already mentioned, the two last-named Lords Justices were of opinion that the appeal should be allowed; and, being in the majority, this was done. The case will, however, in all probability, be taken to the House of Lords.

Lord Justice VAUGHAN WILLIAMS said he had come to the conclusion that the judgment of the Divisional Court, as represented by the judgment of Mr. Justice Phillimore, ought to be affirmed. It appeared to be the view of every member of the Court that if it were not for the provisions contained in section 9 of the Metropolitan Water Board (Charges) Act, 1907, this Act did not intend the result which everyone agreed it would have if the argument put forward on behalf of the Board were adopted. The practical result in such a case would be that all water supplied by the Board to occupied houses or buildings for domestic purposes, subject to the rebate in section 9, would be on the basis of 5 per cent. on the assessed rateable value; and it was admitted on behalf of the Board that, in addition to this assessment, the Board would be entitled to charge the meter price. It was said that it was not improbable that the Legislature deliberately intended this result, having confidence that a body like the Metropolitan Water Board—a great public body who were not making any profit, and only desired to do that which was best for the community—would not in any way abuse these great powers. But when one had to construe an Act of Parliament, if the first and natural meaning of the words led to a conclusion which it was improbable, if not impossible, that the Legislature could have intended, then, if the words were capable of another conclusion, one was led to adopt it if it did not involve the improbabilities and hardship attending the first suggested conclusion. It was admitted here that, apart from the confidence the Legislature had in a body like the Water Board, the construction of the Act of 1907 insisted upon by the Board was one which it was hardly possible could have been intended. Putting it shortly, it was that a provision which had appeared throughout all water legislation, drawing a distinction between water supplied for domestic purposes and for trade purposes, was to disappear altogether. But before dealing with this Act, he would refer briefly to the decision in the case of *Metropolitan Water Board v. London, Brighton, and South Coast Railway Company*, given in July last year.* What had to be dealt with there was the sanitary conveniences at the Norwood Station of the Company; and the question was whether the 8th and 9th sections of the Act of 1907 could be applied in the sense in which it was sought to apply them in the present case. The conclusion of the Court was that they could not, because there was a duty upon the Railway Company to provide the conveniencies in question. It was said that it was a statutory duty in respect of porters and travellers. But it was very difficult to say that there was a statutory duty in regard to the staff; and his judgment would not be given on the basis that, within the principle of the decision in the Brighton case, there had to be a precise statutory duty. He thought, however, that there was a manifest duty on the part of the owners of a factory to provide reasonable sanitary accommodation for the men who worked there, and that this accommodation extended to the provision of such facilities as would enable a man to wash his hands during the course of the eight or more hours during which he had to work. He (his Lordship) had to deal with the matter from two points of view. One was the mere construction of the section concerned, which, of course, would be the same as that adopted by the Court of Appeal in the case; and then he had to see, assuming the construction put upon it by the Water Board to be right, whether there was not something in the present case, as there was in the other, to prevent the application of the section. In the Railway Company's case, its application was prevented because it was said that the supply of water there was not for domestic but for railway purposes. Might it not be equally said that the application in the present case was not for domestic, but for trade purposes? In the main, section 8 did two things. It altered the words in the old Acts, which were either "dwelling-house" or something which gave that sort of qualification to a house, and substituted "house or dwelling"—"house or building occupied as a separate tenement." Then one came to what the owner or occupier was entitled to require—viz., a supply of water for domestic purposes; and the obligation of the Board was that when the communication-pipe had been furnished, the supply was to be at a rate per annum not exceeding 5 per cent. of the rateable value of the house or building in respect of which the supply was required. And then it was specified that such rate should, subject to the provisions of the Act, be charged uniformly under like circumstances to all consumers entitled to the supply. According to section 9, where the Board furnished a supply of water for domestic purposes to any house or building occupied solely for the purposes of any trade or business, and occupied as a separate tenement, they were to allow from the water-rate payable in respect of the supply a rebate or discount of such amount as they might determine. It was said that unless he read this section as extending to every supply of water to a building solely occupied for the purposes of a factory, he was giving no meaning to the words. He could not agree with this. He thought the section admitted, without doing any violence to the language, of the construction put upon it by Mr. Justice Phillimore. Coming to the second point, even assuming that the construction of the section was that put upon it by the Water Board, did the present case come within the principle of that of the Railway Company? As he had already said, in his opinion the principle laid down in that case in no way involved a statutory duty. If it was a duty that resulted in the creation of sanitary conveniences, this was sufficient to make the supply one for other than domestic purposes. These were specified in section 25; and the words "any trade, manufacture, or business" came just as the words for "railway purposes" did in the part of the section that removed from the definition of domestic purposes the things that were mentioned. When the section said "any trade, manufacture, or business," he read it as meaning as in the case of the words "railway purposes" "any trade, manufacture, or business purposes." In his judgment, the way the matter would stand was that if one had a supply of water for sanitary or lavatory purposes which was only furnished because it was necessary (if the business was to be decently conducted) that there should be such conveniences in the house, then such a supply ought not to be treated as for domestic purposes, any more than the water provided for the staff and the porters of a railway company. He treated the decision in the Brighton case as having settled this point. Under these circumstances, he thought the water in the present case ought to be treated as being supplied for trade purposes; and that the appeal should be dismissed.

Lord Justice FARWELL said the Act of 1907 was, to some extent, no doubt, a new departure; but it was not by way of making a clean sweep of everything that had gone before, but a building on the old foundations with certain modifications. From the very commencement, from the Act of 1847, the basis of payment for water had always been the rateable value of the premises supplied; and the old Acts dealt only with a supply for domestic purposes. No mention was made in any of the Acts before that of 1907 of "railway purposes" as distinct and separate from trade purposes. Having referred to various sections of the Act, his Lordship said that when the owner or occupier of premises made his request to the Water Board for a supply of water for domestic purposes, it might be for a tenant of one of three sorts. It might be for a dwelling house for domestic purposes pure and simple; or for a house or building occupied for the purpose of any trade or business, or any profession or calling, and for no domestic purposes at all; or, again, it might be one in which the water was required for domestic and also for trading or business purposes. All these cases were included in the Act. Section 8 dealt with domestic purposes alone; section 9, with the case of water supplied for domestic purposes to a house or building occupied solely for a trade, business, or profession. So that there was no question of mixing up trade purposes with domestic purposes. It assumed that for a building used solely for trade purposes, and not charged with the payment of inhabited house duty, water might be required for domestic purposes. Section 20 provided that the Board were not bound to afford a supply of water otherwise than by measure to any house or building whereof any part was used for a trade or a manufacturing purpose. This was the third case he had mentioned—that of a house used partly as a dwelling and partly for trade purposes. In this case, the Board were not bound to supply water except by meter; but the Act provided that they were not to have less than the amount at which it would be rated according to the assessment of the dwelling. The original basis of assessment by rateable value was preserved throughout the Act; and this remained in all cases of the use of water for domestic purposes. He was unable to see how it was possible to give any meaning to sections 9 and 10 if one said that water used for domestic purposes was also used for trade purposes. Section 9 expressly contemplated premises used solely for business having water required for domestic purposes. But he was unable to put a construction on the Act which enabled him to say: "True it is that these are domestic purposes, but inasmuch as they are purposes which are also required for the healthy occupation of the premises as trade premises, they are therefore no longer domestic purposes but are trade purposes." This view was strengthened by section 20, which also supported the view that the Water Board were entitled, as they submitted, to charge both by meter for water used in that way, and also the rates payable on the annual value of the premises. This being so, though one might say that the particular appliances in question were essential for manufacturing or trade premises, and though they were not only essential but required by Statute, still the Act had in terms treated them as separate and distinct from trade purposes. It was said that the Court were bound by the decision in the Railway Company's case; but to his mind the distinction was marked. His judgment in that case depended upon the distinction drawn by the Act between trade purposes and railway purposes. After reading a passage from his own judgment in that case, his Lordship remarked that, whether it was right or wrong, it was impossible to cite his decision in that case as any authority in favour of the contention in the present case. His view was that a distinction was drawn between railway and trade purposes; and it was this very distinction which enabled the Court to say that railway purposes stood by themselves, and that everything requisite for the proper and efficient working of the railway was not a domestic but a statutory purpose—a railway purpose made so by Statute; that when section 9 treated expressly of trade purposes and domestic purposes as co-existing in the same premises, and refrained from doing so with regard to railway purposes and domestic purposes, it was with the intention, as he inferred, that these purposes should stand on different footings. It might very well be that this would press hardly on the people who used water. It was not for him to criticize the enactments of the Legislature. But when it was once conceded that the Water Board were

* See "JOURNAL," Vol. CXI., p. 338.

entitled to charge on the rateable value in respect of water used for domestic purposes, and in addition to charge for trade purposes, though the quantity used for domestic purposes might be exceedingly small and that used for trade purposes very large, it seemed to him that any question of theoretical equality or fairness disappeared. It was really left to the sense of justice of the Board to make these charges reasonably fair. The very exception—the rebate to be given by section 9—showed this. So far as equality as between the payers of water-rate was concerned, he saw no trace of any attempt to enforce it, except the very rough-and-ready one in section 9, which did not approach theoretical justice at all. But however this might be, he was unable, on the true construction of the Act of 1907, to say that these lavatories, water-closets, and so forth, were not, within the meaning of the old authorities, domestic purposes. He thought the old test still remained—that one had to consider the use to which the water was put, and not the nature of the premises in which it was used. This was made perfectly clear by section 9 of the Act. If he desired to find a case to illustrate the circumstances mentioned in that section, he could not do better than cite the one before the Court. The result was that, in his opinion, his brothers Neville and Coleridge were right; and, with the greatest respect to the President, with whose conclusion he was unable to agree, he considered this appeal ought to be allowed.

Lord Justice KENNEDY delivered judgment to the same effect.

After some discussion, it was arranged that the respondents should be allowed three months in which to determine whether or not they would appeal to the House of Lords, during which time no action should be taken by the Water Board to enforce payment of the costs of the appeal, or recover those paid by them in previous proceedings.

UNLAWFULLY CUTTING OFF WATER SUPPLY.

High Court of Justice: King's Bench Division—March 22.

(*Before the* LORD CHIEF JUSTICE *and Justices* RIDLEY *and* CHANNELL.)

Metropolitan Water Board v. Bibbey.

This was an appeal by the Metropolitan Water Board from a decision of Mr. Cluer, the Magistrate at the Old Street Police Court. On Aug. 31, 1910, the Board were summoned to answer two informations laid by the respondent for having unlawfully cut off the water supply at Nos. 44 and 46, Wilmer Gardens, Hoxton, for non-payment of the water-rate, contrary to the Water Companies (Regulation of Powers) Act, 1887, and the Metropolitan Water Board (Charges) Act, 1907. The appellants were convicted and ordered to pay penalties and costs. The proceedings in the Court below were reported in the "JOURNAL" for Oct. 11, 1910, p. 142.

Section 53 of the Water-Works Clauses Act, 1847, provides that every owner or occupier of any dwelling-house or part of a dwelling-house shall, when he has laid a communication-pipe and paid or tendered the water-rate, be entitled to demand and receive a supply of water. The respondent is the freeholder of the houses in question. In December, 1907, the premises had been leased by him for a term of seven years to Mr. Le Grand, who took over the respondent's business, and traded as Messrs. Bibbey and Co. Bibbey sublet No. 46 to Mr. Grey, at a rental of 13s. 6d. per week inclusive of rates and taxes; and No. 44 was occupied rent free, and also free of rates and taxes, by a caretaker, who collected the rent of No. 44, and kept it for his wages. Messrs. Bibbey and Co. duly paid the water-rate until March, 1910. On the collector applying to them in July for the water-rate for the two quarters ending Sept. 30, he received a letter from the tenant stating that he had nothing to do with the firm; everything having reverted to Mr. James Bibbey. On being applied to, Mr. Bibbey said he had leased the premises to Mr. Le Grand, and that he was not in possession, as he had refused to accept the lease unless he obtained vacant possession. The water-rate being unpaid, No. 44 having been unoccupied since August, and No. 46 empty since July, the appellants cut off the water. Shortly before this was done, the respondent accepted from Mr. Le Grand a surrender of the lease, and resumed possession of the premises.

For the appellants it was argued that they were entitled to cut off the water; and that, in order to constitute an offence, there must be, when the water was cut off, an actual tenant of the premises. It was further submitted that, the premises being unoccupied, the appellants were under no obligation to supply water for domestic purposes. For the respondent it was contended that when the premises came into his possession he was the owner for the time being, and liable to pay the water-rate as soon as he became such owner; also that the appellants were bound to proceed against him under section 4 of the Act of 1887, and were not entitled to cut off the supply, even though for the time being the premises were not actually in occupation of any tenant.

Mr. COURTHOPE MUNRO and Mr. W. F. CLARKE appeared for the appellants; Mr. GIVEEN represented the respondent.

The LORD CHIEF JUSTICE said he was of opinion, on the facts found by the Magistrate, that the appellants had not the right to cut off the water. It had been contended that it was cut off because the houses were empty, and not because the rate was unpaid; but he could not agree with this argument. The real question was whether appellants had cut off the water in contravention of the Act of 1887, which provided that where the owner and not the occupier was liable by law to pay the water-rate, no water company should cut off the supply for non-payment. From May till August there was an owner liable to pay the rate, and at any time, but for the section mentioned, if the rate was not paid, the Board might have cut off the water under section 74 of the Water-Works Clauses Act, 1847. The Board having thus lost the right to cut off the water, what had they in exchange? They had a charge against the premises for the rate, with interest. After Le Grand surrendered to Bibbey, it was impossible to say there was not a person who was liable to pay the rate, as he was the owner within the meaning of section 4 of the Act of 1887.

Justices RIDLEY and CHANNELL concurred; and the appeal was dismissed, with costs.

"Irregularity" with the South of England Natural Gas Company.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Swinfen Eady had before him a motion, on behalf of the executors of a deceased shareholder, that the register of members of the South of England Natural Gas and Petroleum Company, Limited, might be rectified by removing the name of their testator (Charles E. H. Burn) as the holder of 200 preference shares, on the ground of non-compliance by the Company with the terms of section 81 of the Companies (Consolidation) Act, 1908, on the issue of a prospectus dated April 30, 1910. The case for the applicants was that their testator applied for shares on the footing of the prospectus, and that this failed to comply with the provisions of the section of the Act, inasmuch as it did not state that it was a second offer of shares (there having been a previous offer), the amount offered for subscription within the two preceding years, the amount actually allotted, and the amount, if any, paid on the shares so allotted. The applicants sought to have the contract rescinded, the register rectified, and their money paid back. They were met by the Company saying that it was not a second, but a first, offer of shares to the public. His Lordship said he was quite satisfied that this was not so. There appeared to have been considerable irregularity in the matter. The Company filed a prospectus with the Registrar of Joint-Stock Companies, and this document differed from the one put in evidence by the respondents as being their first prospectus. It was clear that this prospectus was an offering of shares to the public; and it was none the less so because only 3000 copies were printed and distributed, and because they were sent to shareholders in gas companies as being the most likely persons to take shares in the new venture. In his opinion, the prospectus complained of was a second offer of shares within the meaning of section 81. But the applicants were not entitled to recision of their contract merely because there had been some breach of the statutory requirements. Their remedy was against the Directors or other persons responsible for the prospectus. The motion therefore failed; and it must be dismissed, but without costs.

Liability for Repairing a Water-Pipe.

At the Westminster County Court, last Wednesday, his Honour Judge Woodfall had before him a claim by the Metropolitan Water Board for £2 5s. 6d. against Mr. Thomas Wallis, of Messrs. Thomas Wallis and Co., for repairing a communication-pipe at his house in the Finchley Road. Mr. Desmond Collins, the Board's Assistant-Solicitor, said the proceedings were taken under section 71 of their Charges Act of 1907, and the question was one of liability; defendant setting up the plea that the pipe repaired was too near the surface of the road. As a fact, the top of the pipe was 1 ft. 5 in. below the surface. This, however, had nothing whatever to do with the defendant's liability. The defendant said he relied upon a case in which the Lord Chief Justice and two other Judges held that a consumer of water was not liable to pay for pipes outside his premises. His Honour said he quite sympathized with the defendant; but he had no defence to the action. It was clear that the Board could repair any injury in a communication-pipe, and recover the expense as water-rate from the consumer. He therefore gave judgment for them, with costs.

Discs in a Prepayment Meter.

At Gainsborough last Tuesday, Edward Whittaker, a professional footballer, was charged, at the instance of the Urban District Council, with burning gas and placing metal discs in his penny-in-the-slot meter instead of the necessary cash. A collector said he found sixteen metal discs in the meter. Defendant gave evidence, and said it had been his custom to place the discs in the meter, and when the collector called give him the money they represented, as the collector had told him that it did not matter so long as he got the money for the gas consumed. He had paid the money, and the collector returned the discs. The Gas Manager (Mr. J. Baldwin) remarked that this was not a practice that had his consent. The Bench said defendant had done wrong, and would be fined 10s.

Warrington Water Supply.—Extensions of the Warrington Corporation water supply, at a total cost of £17,799, have been carried out under the supervision of Mr. J. Gray, the Water Engineer. The chief part of the work consisted in laying an additional 18-inch main to the Winwick reservoir; and the Stanton Coal and Iron Company secured the contracts for the pipes. In the Pargate district, the main is reduced to 12 inches; the supply there consisting of an 8-inch main from the old service and a 12-inch main from the new one.

Londonderry Gas Company.—At the annual meeting of the Londonderry Gas Company, the Chairman (Mr. H. J. Cooke) said the past year had been a highly satisfactory one. The cost of coal had gone up, and the price of gas was lower; but, against this, residuals realized more, and there had been an increase of 3¼ million cubic feet in the quantity of gas sold. The results reflected great credit on the Engineer and Manager (Mr. R. J. Skinner) and the staff generally. The report was adopted, and the usual dividends were declared—10 and 7 per cent. on the original and new shares respectively.

Overtime and Holiday Pay at Bolton Corporation Gas-Works.—The Gas Committee of the Bolton Corporation lately had under consideration the question of the payment for overtime to the employees in their department. There is a movement on foot to place on the same footing all workmen in the service of the Corporation who are paid by the hour; and the following proposals for payment have been put forward: (1) For all work beyond ordinary recognized hours on Sundays, Christmas Days, and Good Fridays, double time; (2) for the first four hours worked after the ordinary time fixed for ending work, time-and-a-quarter; (3) after the expiration of the last-mentioned four hours until the ordinary time fixed for commencing work on the day following, time-and-a-half. The Gas Committee have approved of these proposals so far as they are not inconsistent with the present arrangements of the Gas and Lighting Department.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

Election of a New Director.

An Extraordinary General Meeting of the Proprietors of the Company was held last Thursday at De Keyser's Hotel, E.C.—Mr. CHARLES CARPENTER presiding—for the purpose of electing a Director to fill the vacancy caused by the death of Captain T. B. Heathorn.

The SECRETARY (Mr. F. M'Leod) having read the notice convening the meeting,

The CHAIRMAN said: I have now to move—"That Mr. Frank Harding Jones be elected a Director of this Company." Sir George Livesey, as you know, took a very great interest in the constitution of Boards of Directors, as he did in all other matters connected with our business; and if for the moment I may dissociate myself from the Board, and speak of the remaining members of it, I think it may be claimed that the Board as now constituted carries out the high ideal Sir George had with regard to it. He considered that one of the difficulties in the ordinary method of Company management was sometimes to be found in the constitution of the Board of Directors; and his idea of overcoming this difficulty was that the Board should consist of a fair number of men who were conversant with the details of the particular business which they had to manage. It is, of course, necessary to have on a Board of this character, which does business on a large scale, men of business experience. I think it is also necessary to have on it men having experience in the particular business which they have to manage and control. I remember, too, Sir George, in dealing with the duties of Directors, laying stress upon one of their important duties being the selection of officials to whom the details of the management of the business were to be delegated. He also held the view that a duty no less important than that was in the selection of gentlemen who could be recommended to fill any vacancy which might arise upon the Board. We have been very careful in performing this duty on the present occasion; and the gentleman whom we support is, as it happens, the only candidate who has sent in an application for the position. Mr. Jones has had a lifelong experience in gas matters. It is true he is, comparatively speaking, a young man; but his whole experience has been in the industry with which we are asking you to-day to further associate him through this Company. Mr. Jones has been trained as a civil engineer; and he has specialized in the control and management of gas undertakings. He is a thoroughly competent engineer; and he is conversant with all the management details of the business, which are equally important with the engineering ones. I am speaking for myself and my colleagues when I say we confidently support his nomination; and we feel sure he will carry out the high traditions which have been a feature of the Board of Management of this Company.

The DEPUTY-CHAIRMAN (Mr. Frank Bush) said: In seconding the motion, I desire to say a few words respecting our old colleague and valued friend, the late Captain Heathorn. The name of Heathorn has been long and honourably associated with this Company. The Captain's father, Mr. Joseph Lidwell Heathorn, was appointed a Director in 1838, in the Company's early struggling days—several years before it had obtained its Act of Incorporation. The late Captain Heathorn rendered the Company good service, particularly in the year 1875. At that time he was one of the minority on the Board who warmly supported the policy of Mr. George Livesey (as he then was) for placing the Company under the sliding-scale. Happily, the views of the minority prevailed, with considerable advantage to the proprietors; while the benefit to the consumers of gas in South London cannot be over-stated. Coming now to the resolution before the meeting, Mr. Frank Jones belongs to a well-known gas family. His grandfather, Mr. Robert Jones, was, in his day, a prominent man in the profession. He was Engineer and Manager of the Commercial Gas Company, and afterwards one of its Directors. His father—Mr. Harry E. Jones—is a well-known gas engineer and gas expert. Mr. Frank Jones is associated with, and advises, other gas companies, and I think one might almost say he is saturated with gas. As he happens to be present, I will spare his feelings by not saying anything more about him, excepting this—that I believe his all-round knowledge will be of service to the Company. I have great pleasure in seconding the proposition.

The motion was carried unanimously.

Mr. JONES, in acknowledging his election, said: I am very sensible indeed of the great honour you have done me to-day; and I am equally sensible of the great responsibility which your kindness has put upon me. Mr. Bush has said that I am saturated with gas. Perhaps there would be some confirmation if I detained you by talking too much. [Laughter.] Indeed, I think it would be unbecoming of a new member of the Board of this great Company to talk immediately after his election. It will be time enough to talk when one has done something. However, I thank you for the great honour you have done me.

SAN PAULO GAS COMPANY, LIMITED.

Still Increasing Prosperity.

The Annual General Meeting of the Company was held last Thursday, at Winchester House, Old Broad Street, E.C.—Mr. D. M. FOX in the chair.

The SECRETARY (Mr. G. H. Rogers) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he felt sure the shareholders must have been gratified to receive the report and accounts for the past year. The Company's business continued to make the steady and satisfactory progress to which year by year they had now become accustomed; and during the year under review, there had been a notable increase in every item of receipts. It was a great pleasure and satisfaction to refer to the prosperity and development noticeable on all sides in connection with the Republic of Brazil generally, and especially of the State of San Paulo. To the extraordinary improvement and development of the City of San Paulo during the last decade must be attributed the flourishing position the Company found itself in; and the most encouraging feature of this position, to his mind, was that, without undue optimism, they might confidently expect that, as the city expanded as a commercial, industrial, and residential centre, so would the business and prosperity of the undertaking go on increasing year by year. During the past year, business had been exceptionally good in San Paulo, mainly owing to the remarkable recovery in the price of coffee—the staple export of the State. Exchange during the year fluctuated considerably, varying from 15d. to 18d. per milreis. As the shareholders were aware, during the previous three or four years (*i.e.*, ever since 1907 when exchange was fixed at 15d. per milreis), exchange had been remarkably steady, to the benefit of the planters and commerce generally; and it was satisfactory to know that, after a short period of instability, the official rate of exchange had been now fixed by the Federal Government at 16d. per milreis. Perhaps the shareholders would like to know how this exchange "fixation" affected the Company. As they were aware, the prices of gas were on a gold basis—that was, whatever the rate of exchange might be, they always received the same price, in gold, per unit of gas sold. This arrangement was protective as against loss due to a fall in exchange; but it prevented their deriving any advantage from a rise, as would be the case were the price per unit sold fixed in the currency of the country. For instance, the difference of 1d. between 15d. and 16d. made a reduction on the price of gas to the consumers of about 7 per cent. No doubt, the resulting lower currency price encouraged consumption; and as their Manager in San Paulo remarked, "this involuntary reduction in price is doubtless chiefly responsible for the large increase in consumption during the past few months." On the other hand, all currency receipts, such as from sale of coke, tar, &c., were higher; and the expenditure for wages, &c., all of which were paid in currency, was proportionately increased. On the whole, the official rate of 16d. per milreis was well adapted to the conduct of the Company's business, as was proved by the working of the past few months. It was to be hoped the present official rate of 16d. might be permanently maintained—securing the steadiness in exchange favourable to the Company's business and to commerce generally. The competition of electricity was always keen; but, continuing the same liberal policy as in past years—affording every facility to customers, and thus popularizing the use of gas—the Company had held their own very fairly. The Company enjoyed a good reputation among their consumers, and continued to be on the best of terms with the Government and the Camara Municipal. Turning to the report and accounts, the gross receipts for the year amounted to £203,370; being an increase of £24,170 or 14 per cent. nearly. The working expenses, including London charges, were £157,170—an increase of £22,668, or (say) 17 per cent. The profit for the year showed an increase of £1521 over that for 1909, and amounted to £46,200. Adding to this the dividends on investments, £833, and the balance brought from 1909—viz., £6561—the total became £53,595. From this had to be deducted the charges for interest on, and redemption of, debentures, dividends on the preference and ordinary shares, and other items, amounting to £26,704, and leaving a disposable balance of £26,891. The Directors had placed £5000 to the general reserve; thus raising this fund to £65,000. They had also charged a further and final sum of £2000 to the renewal of the tramway, so closing the account. And they had now the pleasure of recommending the payment of a final dividend on the ordinary shares of 5 per cent. free of income-tax, making 9 per cent. for the year, and leaving £7391 to be carried forward to next year's account. It would be noted with satisfaction that, notwithstanding the increase of preference share capital in April last, and the provision made for the redemption of the whole of the debentures, which together had required £3146 more than the previous year, they were able to recommend the payment of the same dividend of 9 per cent. free of tax, and carry forward an increased balance to the next account. The Directors had every reason to believe that in the future this rate would be maintained, if not increased. Replying to questions in a letter from a shareholder, he said the increase in salaries and wages was no doubt larger in proportion than the increase in the output and sales of gas. This was partly owing to labour troubles, especially with the stokers, who were mostly Italians; and wages had a tendency to increase in San Paulo, as in other places. Another cause of the increase was the rise in exchange during the year from 15d. to 16d., and even 18d. Wages were paid in currency, whereas the prices for gas were fixed on a gold basis; so that a rise in exchange meant a reduction in the receipts in milreis, while the wages paid in currency remained the same. About 7 per cent. of the rise might be attributable to this cause. As to the item of works improvements, it must be remembered that the works were some forty years old, and what was considered good practice, and adapted to the requirements of the city as it then was, must be entirely out of date to-day. Consequently, the Directors had been, and were gradually, remodelling the works in many respects, as well as enlarging them. When they thought of what changes had occurred, the wonder to him was that they had been able to effect so much in the enlargement and improvement of the works, and of the service generally, with such a small addition to the capital. The capital expenditure during the year amounted to £31,286; and comprised: Land, £3015; new mains, £15,957; lamps, £4018; meters, £4640; plant, &c., £3654. In addition to this expenditure, there had been considerable outlay on the works on enlargements and improvements, which had been temporarily termed "Works Improvements." This expenditure was not all of a capital nature; and a part of it would therefore have to be gradually written off. Pending the completion of the work in hand, and the proper allocation of the expenditure as between capital and revenue, the amount was held in suspense. An installation of high-pressure lighting on the Keith system in the streets and grounds adjacent to the New Municipal Theatre was completed, and had recently been inaugurated. It promised to be an excellent advertisement of the capabilities of gas under modern conditions, and at the same time a distinct embellishment of the locality. On the other side of the balance-sheet, their capital

was increased by the issue of 5250 preference shares in April last, 4756 of which were taken up by the shareholders or their nominees; those not taken up, 494 in number, being sold on the market at 30s. per share premium. The reserves stood at a substantial figure; and after the transfer of £5000 now recommended, they would exceed £89,000. With regard to the present year, there would be an appreciable increase in the cost of coal and oil owing to the recent rise in freight rates. Coal rates were some 3s. to 4s. per ton above the average. Against this could be set the rather lower price of coal; the contracts made earlier in the year being on the average 1s. per ton less on the f.o.b. price. He could not conclude his remarks without a warm tribute to the business capacity of their new Manager in San Paulo (Mr. Norman Biddel). During this his first year of full management, he had won the good opinion of the Board; and they recognized that he had known how to secure and preserve the Company's excellent relations with the Government, the Camara Municipal, and the public generally in San Paulo. Their Engineer (Mr. White) continued to render excellent service; and it was gratifying to know that these two officers were working together loyally in the Company's service.

Mr. A. F. PHILLIPS seconded the motion, which was unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. M'KERROW, a dividend was declared of 6 per cent. on the preference shares, less income-tax, and on the ordinary shares of 5 per cent., free of tax, making, with the interim payment, 9 per cent. for the year.

Mr. PHILLIPS proposed, and Dr. STRAIN seconded, the re-election of the Chairman to his seat on the Board. Both gentlemen spoke of the great value that Mr. Fox's knowledge of the City of San Paulo and of the Brazilian people was to the Company.

The motion was carried unanimously.

The CHAIRMAN having acknowledged it,

The Auditors (Messrs. Cash, Stone, and Co.) were reappointed, on the motion of Dr. STRAIN, seconded by Mr. WILLIAMS.

The CHAIRMAN moved a vote of thanks to the Company's Manager (Mr. Norman Biddel), Mr. White, and the staff generally in San Paulo, and the Secretary (Mr. Rogers) and the staff in London. He warmly eulogized the services of one and all.

Mr. BARREYMAN seconded the motion, and it was unanimously carried.

This concluded the proceedings.

GERMAN CONTINENTAL GAS COMPANY.

Annual Report and Accounts.

We have received, from Herr W. von Oechelhaeuser, the General Manager, a copy of the report and statement of accounts for the year 1910, which are to be submitted to the general meeting of the German Continental Gas Company, to be held to-day (Tuesday) at Dessau.

The year 1910 was the 56th year of the Company's operations, and was signalized by a satisfactory increase in the consumption of gas—viz., 6·06 per cent. over that for the previous year, which, however, had shown the comparatively small increase of 3·22 per cent. over 1908. The total profit—viz., 3,643,756 marks (£178,615) is higher by 7·77 per cent. than that for 1909; but it is proposed to pay a dividend at the rate of 9 per cent. per annum as in the past two years. Prices paid for coal during the past year were on the average about the same as in the previous year; but owing to the winter being again mild, the prices obtainable for coke showed a still further small set-back. This unfavourable influence on the revenue of the Company was, to a large extent, counterbalanced by better working results—more especially in the direction of a larger make of gas per ton of coal. Ammonia fetched about the same prices as in 1910. But the prices obtainable for tar were better owing, *inter alia*, to the increasing use of tar on roads, the increasing consumption of tar oils in internal combustion engines, and the better quality of the tar produced in vertical retorts.

The use of the new vertical retort-settings, which were introduced, with the best results, at the works at Warsaw, Potsdam, Rheydt, and Elbgau in the year 1909, was extended at Warsaw in the past year, and the new Upper Silesian Central Gas-Works at Bismarckhütte were equipped with vertical retorts only. This works came into action on May 1 last, and, in addition to the ten communities, with a population of about 140,000, which it was originally intended to supply, contracts have been entered into to supply also two other communities, with a population of 36,000. These small towns are supplied from the Central works by means of long-distance high-pressure mains; and a similar main has been laid from the Dessau works of the Company during the year for the supply of the town of Rosslau on the Elbe. In this case, as in others, the supply displaces that from small local works, the gas-holders, distributing plant, and offices of which alone remain in use. The policy of the Company will continue to be directed towards supplying as many places as possible in the districts in which it has works. But in order to obtain the advantages of concentration in manufacture by means of the new vertical retort-settings, which are worked almost wholly mechanically, the system of high-pressure distance supply, which has been in use for many years in the United States, will be extended, and it is hoped that larger towns and communities at a greater distance from existing gas-works will be supplied from the latter. It is pointed out in a footnote to the report that the town of Cleveland, with about 530,000 inhabitants, is supplied from the natural gas fields of West Virginia, at a distance of about 220 miles, with about 70 million cubic feet of gas per diem. As there are at least the same technical and economical possibilities for central works for the transmission of gas across country as for the supply of electricity to a distance, and as the applicability of gas extends not only to lighting and power purposes, but also is of the greatest value for heating, there is, the Directors consider, every prospect of a great extension of the gas industry in this direction.

New contracts or extensions have been entered into with three townships in the district supplied from the Potsdam works of the Company and one new contract has been made in the Elbgau district. At the close of the year, however, the Erfurt works, which had belonged to the Company for 53 years, passed into the possession of the Corporation. The capital thus liberated has been to a large extent applied in the establishment of the new works at Elbgau and in Upper Silesia.

Notwithstanding the economy of the inverted burner and its increasing use, and the energetic competition of the new electric lamps, the gas consumption for lighting purposes has increased at all the works with one exception. The use of gas for heating, cooking, and industrial purposes has shown a rapid advance everywhere. About 24·2 per cent. more prepayment meters are now in use than in 1909. The electricity supply works of the Company at Dessau have also done well, and for the first time have in the past year undertaken the supply of the whole of the current required for the Dessau tramways, which has resulted in the extraordinary increase in the output of 74·9 per cent. A contract has also been made for the supply of current to three more townships from this central works; and the Company has taken the opportunity to acquire the greater part of the shares in the Bernburg Tramway and Electricity Works, in order to bring this town also within the field of operations of its Dessau Central Works. Bernburg will in future be supplied by long-distance transmission from Dessau. On the other hand, the Company's small electricity works at Hagen-Eckesey will stop work, and the supply of current will be taken from the Mark Electricity Works, in which the Company have a substantial interest.

The net profit available for distribution amounts to 177,313 marks (£8692), which is 30,771 marks (£1508) higher than that for the previous year. Substantial contributions are made to the reserve and renewal funds; but having regard to the fact that the profit of the Erfurt works will cease with the close of the year, it is not proposed to pay a higher dividend than in the past year, notwithstanding the increase in the profits. The report states that the total make of gas at all the works of the Company amounted to 85,691,877 cubic metres (about 3,026,300,000 cubic feet); but no details of the technical working are given in this report, such as were contained in the reports of the Company some years ago.

TORQUAY GAS COMPANY.

The Annual Meeting of this Company was held last Tuesday, under the presidency of Mr. R. P. Kitson. In their report the Directors stated that the balance standing to the credit of the profit and loss account was £12,224; and they recommended payment of the usual dividends of 10 and 7 per cent. In moving the adoption of the report, the Chairman congratulated the shareholders on the continued growth of the Company's business, and announced that from Lady Day the price of gas to ordinary consumers would be reduced from 2s. 10d. to 2s. 8d., and to users of gas-engines from 2s. 5d. to 2s. 3d.; and that the discount allowed to users of prepayment meters would be increased from 1½d. to 3½d. in the shilling. The total receipts for the year amounted to £36,464, compared with £36,476 in 1909; and the expenditure was £28,143, against £28,563. The balance carried to the profit and loss account was £8321, compared with £7913. The concessions to consumers which he had announced would take about £2300 a year; but the Directors believed the result would be an increase in the business. With regard to the working during the year, although an additional 5 million cubic feet of gas had been produced, the quantity of coal carbonized was 300 tons less. There was an increase of £700 in the revenue from the sale of gas; but, owing to the decrease in the quantity of coal carbonized, the returns from coke had been less. The Corporation were extending the electric cables in many parts of the borough; but, in spite of the competition, the sale of gas had steadily grown from 127 million cubic feet in 1897 to 182 millions last year. Mr. C. E. Martin suggested that the services of the Company's employees should be recognized by the presentation of a bonus, by giving them an interest in the concern, or by the establishment of a superannuation fund. Mr. Luxmoore remarked that there were difficulties in giving the employees stock; but he thought a strong case had been made out for granting a bonus. Mr. A. Iredale, a Director, pointed out that the present price of 2s. 8d. was the lowest in the history of the Company; and he said the reduction was largely due to the improvements carried out at the works, by which, at the expenditure of many thousand pounds, the cost of manufacture had been lessened. The Chairman, referring to Mr. Martin's suggestion, said it was difficult to see how the employees could be given an interest in the Company. There was no stock; and shares could only be bought in the open market at a high price. The report was adopted.

Hastings Electric Lighting Loan.—At the meeting of the Hastings Town Council on the 17th inst., the Deputy Town Clerk reported that he had received the sanction of the Local Government Board to the borrowing of the sum of £2083 for purposes of electric lighting; the authorized period being 25 years. In the communication covering the sanction, the Board said they considered that before a main was laid the Council should satisfy themselves that a proper and remunerative revenue would be received from it; and that they must impress upon the Council the importance of carefully considering the question from a financial point of view. The communication was entered on the minutes.

Whitby Gas Company.—The annual meeting of this Company was held on the 18th inst.—Mr. Freeman Richardson, the Chairman, presiding. In moving the adoption of the report and accounts, he said the receipts for the year amounted to £8970, and the expenditure to £6661; the balance carried to the profit and loss account being £2309, against £2177 before—an improvement of £132. The sale of gas was a little less last year than in 1909; but this was largely due to the mild weather prevailing during the latter half. A very considerable saving had been effected in the cost of coal. The Directors were obtaining a large proportion of their supplies from a new source; and this, in conjunction with improved methods of operation at the works, had resulted in a greater yield per ton of coal carbonized than was possible previously. The report and accounts were adopted, and dividends of 6 per cent. per annum on the original capital and £4 4s. per cent. per annum on the additional and new additional capital were declared.

WREXHAM GAS COMPANY.

Presiding at the annual meeting of the Wrexham Gas Company, the Chairman (Mr. J. Oswell Bury) said it was once again his privilege and pleasant duty to congratulate the stockholders on the progress of the business.

The report referred to recent extensions of the mains at Coedpoeth, which had been carried out at the request of the Bersham Parish Council, who, having adopted the Lighting and Watching Act, decided to go in for street lighting, and placed an order with the Company for 42 lamps. The lamp used was the inverted one-light Graetzin lamp, in copper case, which had approximately an illuminating efficiency of 120 candles for a consumption of 4 cubic feet of gas per hour. The lighting was very highly spoken of by the residents, and had given complete satisfaction to the Parish Council, who had applied for further extensions. The report also referred to the free-labour maintenance system, which was adopted in July last, and had proved a great success. Under this system, the consumers' burners were attended to weekly, fortnightly, or monthly, according to the number of burners in use, and the consumers' requirements. The labour was supplied by the Company free of charge; and the materials used were charged at reasonable prices. Over 12,000 burners were attended to during the last six months of the year. The Company were the largest individual ratepayers in Wrexham; and the time had certainly arrived when a protest should be made and, if necessary, action taken against what, having regard to the recent decision in the case of the *Attorney-General v. Leicester Corporation*, was an illegal action on the part of the Wrexham Corporation in selling and hiring electrical requisites, and taking shops for the display and sale of electrical fittings, &c. It was decided in the case he had alluded to that the Corporation had misinterpreted their powers, and had been carrying on a business in excess of them. The Board did not mind fair competition, even from municipal traders; but they did object very strongly to the line of competition adopted by the Wrexham Corporation in persistently canvassing gas customers in their desire to extend their electrical fittings business. During the past year, 17 incandescent-lighted gas-lamps in Wrexham were transformed into electric lamps; and in the opinion of the general public, the change from a brilliant, cheap, and thoroughly reliable light to an inferior and erratic illuminant, had proved to be very unsatisfactory. The results of the co-partnership scheme in operation in the Company continued highly satisfactory; the bonus earned by the co-partners during the last year being at the rate of 7½ per cent. on their wages—amounting to £341. He then referred to the excellent services rendered by Mr. W. Heyward (the Secretary), Mr. J. Braithwaite (the Manager), Mr. Owen Evans (the Assistant Manager), and the entire staff of the Company at the works and in the office. The Directors were pleased to congratulate their Manager upon his restoration to health after a severe illness, and sincerely trusted that he would be spared for many years in the Company's service.

The report was adopted, and a dividend of 2½ per cent. for the half year to Dec. 31 (making 5 per cent. for the year) was declared.

Barnstaple Town Council and the "Stand-By" Clause.

At a recent meeting of the Barnstaple Town Council in committee, it was decided to recommend the Council to sanction the following amendment, which had been agreed to by the Gas Company, of clause 22 ("Supply of gas where consumer has separate supply") in the Company's Draft Provisional Order: "Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand or to continue to receive from the undertakers a supply of gas for any premises for which he has at the same time an installation for an artificial illuminant (other than that supplied by the undertakers), unless he shall have agreed to pay to the undertakers for such supply and meter-rent such minimum annual sum as will give to them a reasonable return on the expenditure incurred by them in respect of such premises in order to meet the possible maximum demand for those premises, having regard to the capacity of the meter or meters for the time being thereon: Provided always that in respect of any premises for which the whole supply of gas afforded by the undertakers is taken through a meter of the nominal capacity of less than ten lights, the amount of such minimum annual sum shall not exceed 5s. for any one quarter of a year, and in other cases shall be determined, in default of agreement, by arbitration, in manner provided by the Arbitration Act, 1889." The clause as originally drafted was as follows: "Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand or to continue to receive from the undertakers a supply of gas for any premises for which he has at the same time a supply of gas from an installation other than that of the undertakers, or a supply of electricity, unless he shall have agreed to pay to the undertakers such minimum annual sum as will give to them a reasonable return on the capital expenditure, and will cover other standing charges incurred by them in order to meet the possible maximum demand for those premises; and the sum to be paid shall be determined, in default of agreement, by arbitration, in manner provided by the Arbitration Act, 1889."

Sale of Shares.—Acting under instructions from Trustees, Messrs. Harrie Stacey and Son offered for sale last Tuesday 100 fully-paid £5 shares in the Redhill Gas Company, on which 10 per cent. per annum has been paid for some years. They fetched £10 2s. 6d. each. On the same occasion, £100 of "B" (5 per cent.) stock of the Company realized £102.

New Joint-Stock Companies Registered.—The Continental Construction Corporation, Limited, has been registered with a capital of £500,000, in £1 shares, to carry on the business of constructors, improvers, managers, and controllers of public works (including gas, electric light, water, and power supply works), &c. The Kirkconnel Gas Company, Limited, has been registered with a capital of £5000, in £1 shares.

INCREASING GAS SALES IN ITALY.

It is satisfactory to learn that, notwithstanding the keen competition of the electric light, the annual gas sales of various Italian gas companies continue to show an upward tendency. Thus from the report of the annual meeting, held on the 3rd inst., of the "Società Italiana Per Il Gas," it is seen that there has been an increase of 7·3 per cent. in the amount of gas sold, as compared with the previous year. The figures of the four towns in which this Company are interested are as follows:—

Gas Sold—Cubic Metres.

	1909.	1910.	Increase.
Turin	20,136,802	21,597,891	7·2 per cent.
Bergamo	1,694,051	1,790,645	5·6 ,, ,,
Tortona	451,055	473,677	5·0 ,, ,,
Girgenti	325,382	405,594	24·7 ,, ,,
Totals	22,607,290	24,267,807	Average 7·3

The price of coal purchased at the beginning of 1910 was about 12s. a ton at Newcastle; and though the strike at Cardiff hardly affected the Company's supply, yet as a precaution some American "Westmoreland" coal was bought to serve as an enriching medium, or as a stand-by in case of need.

No new works of any importance, except a new pump-room, were carried out last year; but land adjoining the Borgo-Dora Gas-Works at Turin has been purchased. The usual extension to the mains, services, and street-lamps has been in progress. The considerable increase of demand at Girgenti will necessitate this year the construction of a new bench of retorts, and the continuation of the existing retort-house. The present year will also see, it will be remembered, the exhibition at Turin to commemorate the founding of Italian unity; and gas illumination will be provided in the streets and elsewhere.

The Italian Gas Company referred to above are also concerned in two other Companies—the "Società Italiana dell' Industria del Gas" and the "Società Ferrarese del Gas." The gas sales of these also show progressive results.

Gas Sold—Cubic Metres.

	1909.	1910.	Increase.
Società Industria	9,522,788	10,068,857	5·7 per cent.
Società Ferrarese	1,416,293	1,574,850	11·2 ,, ,,

The former Company have happily renewed two of their concessions or contracts for the lighting of Cremona and Novara; and the latter have had extended for twenty years their concession at Savona.

Altogether, Italian gas companies have shared in the general progress and prosperity of gas through the last year, and everything promises well for their future.

GAS PROFITS AND THE RATES AT STOCKPORT.

A Special Meeting of the Stockport Town Council was held last Friday, when the estimates of the various Committees were approved, and a rate of 6s. 2d. laid, which, with the poor rate, makes a total of 7s. 6d. in the pound—the same as last year. The Finance Committee have been able to manage without increasing the rates; but this was only made possible by the increased grants secured from the profit-earning departments. The Gas Committee, for instance, agreed to hand over out of profits £19,100, compared with £18,000 last year and £15,000 in 1909. The Electricity Committee will contribute £1500, as against nothing last year. The total from the various departments in aid of the rates is £27,000.

Mr. H. Bell, the Chairman of the Finance Committee, explained that the total estimate for the year was £147,895, an increase of £6109 on the preceding year. By the help of the increased grants from the profit-earning departments, and the general income of the Corporation, they would be able to keep the total rate at 7s. 6d., as it had been for several years past. He found himself in a somewhat anomalous position, because he did not altogether agree with what he was proposing. He did not think the conclusions arrived at by the Finance Committee were wise, or that they conduced to sound finance. He had his own opinions on this matter; but no one to whom he had spoken seemed to agree with him. He did not want to see the rates go up; but he recognized the necessity, and thought they ought to face the difficulty. In 1905, the amount received in aid of rates from the profit-earning departments was £10,000; this year the sum was £27,000. He would like to ask, "Can these profits go on increasing? Can the various Committees concerned continue such grants as these? How long would the Gas Committee withstand the demand for a reduction in the price of gas?" Only at the last meeting of the Council there was a motion that the price of gas be reduced 3d. per 1000 cubic feet to the ordinary consumers. A reduction of 1d. meant a burden on the rates of £2400; and if this demand had been allowed, it would have meant an increase of 6d. on the rates.

Alderman Fernley, the Chairman of the Gas Committee, said Mr. Bell had brought his influence to bear upon him to provide as much money as possible from the gas undertaking in aid of the rates; and he was glad to say that his Committee had supported him in making the increased grant, which was a record for the department.

Mr. Brewster maintained that to extract such a large amount from the Gas Department in aid of the rates was an injustice to the consumers.

Mr. J. Barrodale, while admitting that the Gas Department must be in good and capable hands (because otherwise they could not make such profits as they had done), said it seemed to him a most unfair thing that many of the poorest gas consumers in the town should have to pay a certain price for gas, in order that people who were better off could have it cheaper.

Alderman Sharples observed that it was very important, as Mr. Bell had said, to ask how long the profit-earning departments could continue to hand over such large sums in aid of the rates. He had had some

twelve years' experience of the Council, and had noted the progress made by the reproductive undertakings; and his reply to the Chairman of the Finance Committee was that, so long as they pursued their work on the business lines which were now observed, insisting upon getting the greatest value out of the undertakings, so long would the profits continue to increase. These concerns were now realizing £27,000 in relief of the rates; and, with good management and shrewd judgment, and no interference by members of the Council who were not engaged in their management, he would prophesy that in the course of five years the profits in aid of rates would reach £40,000.

Alderman LEES said they could not count on these large sums being always voted from the profit-earning departments. It was unfair, for instance, that the price of gas should be maintained at its present level in order that a much larger amount could go to the rates—this relief being participated in by those who did not consume gas.

The recommendations of the Finance Committee were adopted.

SUPPLY OF GAS APPLIANCES BY CORPORATIONS.

Protest by the Ironmongers' Federation against Municipal Trading.

The subject of municipal trading was discussed at the second day's sitting of the annual conference of the Ironmongers' Federated Association, opened at the Grand Hotel, Manchester, on Monday last week—Mr. Richard Melhuish (London), the President, being in the chair.

The matter was introduced to the conference by Mr. J. H. Meakin, of Birmingham, who moved the adoption of the following resolution: "That, in view of certain municipalities having recently sought extended powers respecting the execution of internal work in electric lighting and gas-fitting, this conference considers it desirable that the general subject of trading by local governing bodies should be reconsidered, and, in the interests of local trading communities, so far as possible, eliminated." In the course of his speech, he argued that municipal trading was an unfair and dangerous monopoly, and was carried on by an inefficient and irresponsible management. It was extravagant and unbusinesslike, and it killed individual enterprise, initiative, and reasonable trading competition. Referring particularly to what he described as the incursion into the ironmongery and allied trades by corporation gas committees, the speaker complained that municipalities, on taking up a particular trade, did not buy up all the undertakings which their activities endangered. With amazing unconcern, they proceeded to the establishment of show-rooms in the particular undertaking which had been bought up with public money, so as to make the ruin of those whose livelihood was gained in the trade only a matter of time." No private trader could compete on equal terms with a municipality, since its power to draw on capital was unlimited. Instances could be given of certain municipalities doing work for householders and for private firms, the charge for which did not even cover the cost of the materials used. Gas-cookers were hired out at rentals which only covered the interest on the outlay; and the net cost of the cookers in this way became a dead-loss to the department.

The motion was seconded by Mr. Theedam, of Dudley, who said he was prepared to agree that the municipality of a town should control the gas, electricity, and tramways undertakings; but they should only step in if private enterprise failed. He contended that a private trader could conduct a business more economically than a municipality.

In the subsequent discussion, reference was made to the claims of gas engineers for gas control to the point of ignition, the maintenance and supply of burners and mantles for incandescent lighting by certain gas undertakings, and the supply and fixing of gas-fires free or at a reduced cost. There was a consensus of opinion that the most advanced municipalities had gone as far in municipalization in this direction as they should be allowed to go. Some speakers held that many municipalities had already gone too far in this matter, and argued that steps should be taken by the Federation to at once stop the practice. Strong exception was taken to corporations putting up gas and electric light installations in private houses.

The motion was carried unanimously.

Later in the day, the matter was taken a step further, when it was decided to form a reserve fund to fight municipalities who endeavour to get clauses inserted in Bills for providing free wiring in electric light installations. It was stated that the fight would probably be a prolonged one, as several corporations had already sought to secure such clauses, but had been obliged to abandon the project on account of the strong opposition offered.

TWICKENHAM PUBLIC LIGHTING.

Brentford Gas Company's Tender Accepted.

At the Meeting of the Twickenham Urban District Council last Thursday, the Lighting Committee reported that they had considered tenders received from the Brentford Gas Company and the Twickenham and Teddington Electric Supply Company, Limited, for the public lighting. The prices quoted by the Gas Company were for supplying gas only to the whole or a portion (not being less than 200) of the lamps, for a period of twelve months; and they ranged from £1 5s. 8d. up to £7 0s. 6d. per lamp per annum, according to the kind of burner and gas consumption per hour. As an alternative, if the Council were prepared to enter into a contract to continue the supply to the whole of the lamps at present used for a period of five years, the prices would be reduced; the difference amounting approximately to £104 12s. per annum. The prices quoted by the Electric Supply Company for current and the renewal of metallic filament to approximately 500 street-lamps in the roads where cables are now laid ranged from £1 5s. up to £11 15s., *plus* the cost of laying a service cable to the lamp-post, converting the lantern, &c. The Company pointed out that if a contract were entered into for a longer period, the greater portion of the present heavy expenditure in connection with the lighting and extinguishing of the lamps could be obviated by the adoption of time switches, by which the whole of the street-lamps would be switched on and off at any one definite hour.

At the present time, the district is lighted by gas—the burners employed being chiefly of the Welsbach pattern, with a gas consumption varying from 3·2 to 4·2 cubic feet per hour; and the approximate cost of these burners, including gas, lighting, repairs, and maintenance, varies from £2 10s. to £2 18s. per lamp per annum. For the purposes of comparison, it will be sufficient to take a gas-burner consuming 4·2 cubic feet per hour, and having approximately 100-candle power, against a metallic filament lamp of approximately the same power. For the supply of gas to burners of this description, the quotation of the Gas Company, based on a contract for twelve months, is £1 13s. 8d. per lamp per annum; and the present average cost of maintenance, &c., which is carried out by the Council, is £1 2s. 4d.—making a total cost of £2 16s. per lamp per annum. If the price for gas were based on the terms quoted for a five-years' contract, the total cost per lamp per annum would be reduced to £2 12s. 6d. The quotation of the Electric Supply Company for current and renewal for a lamp of approximately 100-candle power, based on a contract for twelve months, is £2 5s. per lamp per annum; and the Surveyor's estimate of the cost of lighting, cleaning, and repairs is 15s. per lamp per annum—making a total of £3. To this amount it would be necessary to add the cost of the repayment of capital and interest in respect of laying on the service, alterations to lantern, &c., which, at 4 per cent. for a period of ten years, would amount to 7s. 4d., or a total of £3 7s. 4d. per lamp per annum. As an alternative, if the lamps were fitted with time switches, the Surveyor estimates that the cost would be reduced to approximately £2 19s. per lamp per annum.

The Committee carefully considered the question, and expressed the opinion that it would not be desirable to enter into a contract for any lengthy period, or to incur the expense of the alterations which would be necessary for lighting any portion of the street-lamps by electricity. They accordingly recommended that the tender of the Gas Company for the supply of gas only (maintenance, lighting, extinguishing, &c., being undertaken by the Council) to the whole of the street-lamps in the district should be accepted for a period of twelve months from April 1, 1911; and this was adopted.

BURY GAS-WORKS EXTENSIONS.

Local Government Board Inquiry.

The Bury Corporation having applied to the Local Government Board for sanction to borrow £37,000 for the purposes of their gas undertaking, Mr. A. W. Brightmore, M.Inst.C.E., one of their Inspectors, held an inquiry last Wednesday in the Council Chamber, Bury, in regard to the application. Originally the Corporation decided to seek powers for raising £60,000; but at a recent meeting of the Council a resolution substituting the lower amount was passed—the Town Clerk stating that the difference between the two sums was in respect of works not at present in contemplation.

Mr. R. Battersby, the Deputy Town Clerk, explained that the money was required to cover capital expenditure on the gas undertaking during the next ten years. No new buildings were intended to be erected under the powers asked for; the money being required chiefly for plant. In answer to the Inspector, he said the estimated capital expenditure on the gas undertaking during the past ten years had been £66,105.

Mr. H. Simmonds, the Gas Engineer and Manager, presented some statistics as to the undertaking. He said the Corporation sold last year 400 million cubic feet of gas; and for the current financial year the output would be about the same. The heaviest daily delivery last year was 2,250,000 cubic feet; and the average daily consumption in December was 1,800,000 cubic feet. Gas was sold at 2s. per 1000 cubic feet to consumers within the borough, and at 2s. 7d. in the added areas. Prepayment meter users were supplied with 32 cubic feet of gas for 1d. The profit made on the undertaking last year was £7156.

Some discussion took place as to the period of repayment for the loan. The Borough Treasurer (Mr. R. W. Buxton) said he would like to have a fixed period for the repayment of these loans, as it would be better for the Corporation and for the Local Government Board. They had a large number of loans spread over so many different periods, that it made it difficult to keep the accounts. The Board had encouraged them to consolidate some of their loans, in order to bring them over one period. In 1904, the Corporation obtained a fixed period of 22 years for their gas account, instead of seven or eight different periods. He wished the Board would carry the procedure further, as it would be better for everybody.

In reply to the Inspector, Mr. Simmonds said he would suggest a common period of 22 years in respect of the present loan.

The Inspector said it was the Board's practice to specify separate periods; but he would point out to the Department what Mr. Buxton had said.

Quality of Bristol Water.—At a provincial sessional meeting of the Royal Sanitary Institute, recently held in Bristol, Mr. J. A. MacPherson, M.Inst.C.E., the Chief Engineer of the Bristol Water Company read a paper on "Modern Methods for the Purification of Public Water Supplies." In the course of it, he stated that for many years the water supplied to Bristol was so pure that filtration was deemed superfluous; but to ensure absolute security the Company commenced to instal open sand filters in 1887. These had been added to from time to time, and at present the installation was first class. The filters were ten in number, and were 7·63 acres in extent. The Company had made many experiments with regard to sand, and the bulk of that which they now used was obtained from pits in the lower greensand at Leighton Buzzard under stringent conditions. The Medical Officer of Health and the City Analyst kept the Bristol water under observation; and they could speak highly of its quality.

METROPOLITAN WATER BOARD.

The Board's Financial Position—Modified Reservoir Scheme.

At the Meeting of the Metropolitan Water Board last Friday, the above subjects were the conspicuous features of the proceedings.

In the course of a review of the Board's work, the Chairman (Mr. E. B. Barnard) said that when they acquired the undertakings of the eight Metropolitan Water Companies they were made responsible for a debt of £50,000,000 of stock. They paid too much for the undertakings. Had they bought them on the terms applied in connection with the acquisition of the docks by the Port of London Authority, they would be £3,000,000 better off. The Charges Act of 1907 left them worse off, and by it they lost £28,000 a year; and many people sank wells, at a further loss of £20,000 yearly. This made approximately £50,000 a year lost through the Act. The Board were paying £77,000 a year more in rates and taxes; while improved conditions of labour, &c., caused further expenditure. Altogether, these items totalled to about £100,000; while the £70,000 that was being paid for superannuation, &c., brought the permanent annual additional charge on the Board up to £170,000 more than that spent by the Water Companies. The Board's total surplus, however, was £39,000 and the deficiency £71,000. This left the net deficiency at the end of March, 1910, at £32,082. But had there been no Charges Act there would have been no deficiency. The Board had saved in sinking fund £208,000; whereas the deficiency only amounted to £32,082. Could anyone after this say there was evidence of profligacy in administration? The Companies had 980,000 customers, and the Board had 1,100,000. The Companies received 8s. per head and £2 11s. 8d. per supply; whereas the Board received only 7s. 10d. per head and £2 10s. 5d. per supply. This 2d. per head difference meant that the Board received about £60,000 a year less than the Companies. The maintenance charge per head of the population during the last five years of the Companies' administration was 1s. 9·96d. The Board's average over the last five years was 1s. 9·44d., or a saving of ½d. per head. The Companies management per head cost 6·25d., while the Board's cost was 6·09d., or a saving of 0·16d. In other ways also economy had been effected. If the Board's work were looked into closely, it would be found that it was fully justified.

The Law and Parliamentary Committee submitted an urgency report informing the Board that a number of petitions had been presented against the Board's New Works Bill on the ground that the reservoirs proposed would prejudicially affect the amenities of the Thames. A strong appeal was made that the Board should abandon reservoir No. 8, which it was proposed to construct in close proximity to the banks of the river opposite Walton, and set back the banks of reservoirs Nos. 1 and 2, proposed to be constructed below Datchet. The Committee considered it would be desirable to accede to the appeal; and accordingly reservoir No. 8 would be withdrawn from the Bill and the other two reduced in size so that they would not be within 600 feet of the Thames. The Chairman of the Committee (Mr. J. B. P. Karslake) said the conference which had taken place had done a great deal of good; and the Committee had been able to ascertain what was the serious objection of public bodies to the Bill. Having done this, they felt that it was their duty to modify the scheme. The Engineer (Mr. W. B. Bryan, M.Inst.C.E.) said the reservoir withdrawn was the least important. Dr. Beaton expressed the fear that the reduced size of the reservoirs would result in it being impossible to store the water for an adequate period. He also understood that the intake was to be constructed alongside the Windsor sewage farm. In these circumstances, he did not wonder that the Public Health Committee of the London County Council were expressing anxiety. Mr. Karslake said the reservoir to be abandoned was the most objectionable one to the locality. The alterations in the scheme would not affect the purity of the water supply. The report was received.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The visit of the Western District of the Scottish Junior Gas Association this afternoon to the experimental vertical retort installation in the Temple Gas-Works brings to a close the session in the west. The district have made a brave show during the winter; having had a most successful time, as regards the subjects discussed and numbers attending and taking part in the proceedings. But it will be admitted that the last item on the programme has outshone all the others. It was, indeed, a great privilege which was accorded to the members when they were invited to view the nucleus of what will, in time, be the largest installation of vertical retorts in the country. The privilege was most gratifyingly taken full advantage of by the honorary, as well as by the ordinary members. The installation, it was felt, is characterized by great simplicity. There was an entire absence of noise and of dirt or dust. The advent of vertical retorts bids fair to effect a revolution in gas production of which we have not seen the like.

In the Glasgow Town Council on Thursday, Mr. Kennedy moved that it be remitted to the Gas Committee to report as to the expediency of all contracts for the purchase of coal needed at the various gas-works being exclusively confined to colliery owners. Bailie Paxton, the Convener of the Gas Committee, moved the previous question. It was a very well known fact, he said, that if they did not recognize, and did not buy their coal from merchants, the same price would require to be paid by the Corporation as by ordinary consumers, because the owners of the coal pits would simply put the profit into their own pockets. Mr. W. F. Anderson opposed the motion. He knew that it was quite a common thing to be able to buy a commodity as cheaply from an agent as from the producer. Mr. Drummond said he would be very sorry if the Corporation were to bind themselves in any way in this matter. Mr. Bruce Murray thought the subject was well worthy of their consideration. It was the principle adopted by some of the largest buyers of coal in Glasgow and other cities, more particularly in connection with steamships. He knew it was a condition of many of the invitations to tender that the coal should be supplied by the owners of certain pits. The previous question was adopted by 27 votes to 21.

The Falkirk Town Council on Tuesday had a difficulty before them which arises out of a long-delayed charge for gas. The consumers are Messrs. M. Cockburn and Co. Originally the claim against them was for £450, in respect of gas consumed between May, 1906, and February, 1911. Quite recently, the Corporation consulted Mr. Yuill on the subject; and his report to them was to the effect that the Company

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 901.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 14	5	Alliance & Dublin Ord.	83—86	+1	5 16 3
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
200,000	5	Oct. 28	7	Bombay, Ltd.	6½—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Feb. 24	15	Bourne-mouth Gas & Water B 7 p.c. Pref. 6 p.c.	28—29	..	5 3 5
311,810	10	,,	7		16—16½	..	4 4 10
75,000	10	,,	6		14½—15	..	4 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	252—255	+1	4 18 1
330,000	,,	,,	9½	Do. New	197—200	+1	4 15 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	215—218	..	5 0 11
246,320	,,	,,	8	Do. A Ord. Stk.	155—158	..	5 1 3
460,000	20	Sept. 29	10⅝	British	44½—45½	..	4 13 6
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	96—98	..	4 1 8
109,000	,,	Feb. 10	6	Bromley, A 5 p.c.	116—118	..	5 1 8
165,700	,,	,,	4½	Do. B 3½ p.c.	87—89	..	5 1 2
82,278	,,	,,	5½	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb.	84—86	..	4 1 5
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	96—98	..	4 1 8
100,000	10	—	—	Cape Town & Dis., Ltd.	3½—4½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	6—6½	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88—90	..	5 0 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109—111	+2	4 10 1
1,513,280	Stk.	,,	5/9/4	Commercial 4 p.c. Stk.	113—116	..	4 14 3
560,000	,,	,,	5½	Do. 3½ p.c. do.	108—110	..	4 16 11
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77—79	..	3 15 11
800,000	Stk.	,,	4	Continental Union, Ltd.	95—97	..	4 2 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—138	..	5 1 5
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103—105	..	4 15 3
840,150	10	Jan. 27	10	European, Ltd.	19½—20½	..	4 17 7
16,179,445	Stk.	Feb. 24	4⅜	Gas-light and Coke 4 p.c. Ord.	105¼—106¼	..	4 7 7
2,600,000	,,	,,	3½	3½ p.c. max.	85—87	..	4 0 6
4,062,235	,,	,,	4	4 p.c. Con. Pref.	101—103	..	3 17 8
4,531,705	,,	Dec. 15	3	3 p.c. Con. Deb.	79—81	..	3 14 1
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92—94	..	5 6 5
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17⅞—18	..	6 2 3
131,000	Stk.	Mar. 10	7⅜	Ilford A and C	143—146	..	5 1 0
65,780	,,	,,	5⅜	Do. B	113—115	..	5 2 2
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
4,940,000	Stk.	Nov. 11	9	Imperial Continental	191—193	..	4 13 3
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	119—121	..	4 19 2
561,000	Stk.	Feb. 24	10	Liverpool United A.	214—216	..	4 12 7
718,100	,,	,,	7	Do. B.	161½—163½	..	4 5 8
306,083	,,	Dec. 30	4	Do. Deb. Stk.	101½—103½	+1½	3 17 4
75,000	5	Dec. 15	6	Malta & Mediterranean	4½—5	..	6 0 0
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 11	3½	Monte Video, Ltd.	12½—13½	..	5 5 8
1,775,892	Stk.	Feb. 24	4⅜	Newc'tle&G'tesh'd Con.	100½—101½	..	4 6 2
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	89—90	..	3 17 9
55,940	10	Mar. 10	7	North Middlesex 7 p.c.	14½—15½	+½	4 10 4
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	139—141	..	5 13 6
60,000	5	Sept. 15	8	Ottoman, Ltd.	7—7½	..	5 6 8
31,800	53	Feb. 24	13	Portsea Island A	130—132	..	5 3 8
60,000	50	,,	13	Do. B	123—125	..	5 4 0
100,000	50	,,	12	Do. C	116—118	..	5 1 8
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	Oct. 28	7	Primitiva Ord.	7⅞—8	..	4 7 6
796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5½—5⅝	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mar. 24	9	San Paulo, Ltd.	15½—16*	..	5 12 6
115,000	10	,,	6	Do. 6 p.c. Pref.	11½—12¾*	..	4 16 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Aug. 31	10	Sheffield A	235—237	..	4 4 5
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,500	,,	,,	10	Do. C	235—237	..	4 4 5
70,000	10	Oct. 14	6	South African	10¾—11	..	5 9 1
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	79—81	..	3 14 1
209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	153—155	+1	5 3 3
605,000	Stk.	Feb. 24	5⅜	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 14 4
60,000	5	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	Nov. 11	5	Southampton Ord.	111—113	..	4 8 6
120,000	Stk.	Feb. 10	7	Tottenham A 5 p.c. and B 3½ p.c.	141—143	..	4 17 11
483,940	,,	,,	5½		115—117	..	4 14 0
149,470	,,	Dec. 15	4	Edmonton 4 p.c. Deb.	98—100	..	4 0 0
182,380	10	Dec. 30	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	112—113	..	4 8 6
255,636	Stk.	Feb. 24	6⅔	Wands-worth B 3½ p.c.	141—143	..	4 14 5
85,766	,,	Dec. 30	3	3 p.c. Deb. Stk.	73—75	..	4 0 0

Prices marked * are "Ex. div."

owed the Corporation to May 5, 1906, £126 odd. On Feb. 2 a firm of solicitors, on behalf of Messrs. Cockburn and Co., offered to pay £52 5s. 9d. in full settlement of all claims down to May 5, 1910. The Gas Committee recommended that a claim be made for £126; and the discussion which took place in the Council had mostly to do with the reason why the claim for £450 was not now insisted on. It was explained that Mr. Yuill's report had been seen by only the Town Clerk as yet, and that the subject was being dealt with in the manner it was in view of the possibility of its being taken into the Law Courts. After a long discussion, a small Committee was appointed, with powers to deal with the matter.

In consequence of the continued increase in the consumption of gas in Johnstone, and in the new districts supplied from there, the Gas Manager (Mr. R. L. Deans) has presented a report to the Corporation, in which he proposes an extension of the gas-works.

Shortly before nine o'clock on the evening of Saturday last, the Corporation electric current in Dalkeith failed, and the streets and roadways, as well as the shops and public buildings which are lighted by electricity, were thrown into darkness. A performance in the Foresters' Hall had to be temporarily stopped; and business throughout the town was greatly inconvenienced. The current was ultimately restored; but after about half-an-hour it again gave out, and was not available for fifteen minutes.

The Laurencekirk Lighting Society, which is another name for the Gas Company, held their annual meeting on Wednesday. It was reported by the Directors that, after providing for depreciation, the profit for the year amounted to £205.

Following upon a request by Messrs. R. & A. Main, Limited, regarding the supply of gas-cookers in Grangemouth, the Gas Committee considered the subject; and at a meeting of the Town Council on Monday they suggested the advisability of holding an exhibition of gas appliances in the town, and also that arrangements be made for canvassing the community in the matter of gas-cookers. The Council were favourable to the suggestions, and left them in the hands of the Gas Committee.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 949.]

LIVERPOOL, *March* 25.

Sulphate of Ammonia.

Since the commencement of this week, the lack of strength in the position has become more pronounced, dealers having apparently secured their requirements earlier in the month and consumers generally having now adopted a hand-to-mouth policy. The result has been a further decline in values, and at the close the market is barely steady at £14 1s. 3d. per ton f.o.b. Hull, £14 2s. 6d. per ton f.o.b. Liverpool, and £14 5s. per ton f.o.b. Leith. There has naturally been less interest shown in future delivery; but manufacturers continue to hold for £14 per ton for May-June, and £13 12s. 6d. per ton July-December, f.o.b. at the principal ports. Some second-hand sellers are, however, reported to be offering at lower prices for shipment over both periods.

Nitrate of Soda.

The tone of this market remains dull, but holders maintain their quotations of 9s. 7½d. per cwt. for ordinary quality and 9s. 10½d. for refined, on spot.

LONDON, *March* 27.

Tar Products.

There has been very little change in the markets for tar products during the past week. Pitch remains in about the same position. Buyers are not very numerous for prompt delivery, and will not purchase at the present prices for forward. Benzols show further signs of weakening. Solvent naphthas are steady, and heavy naphtha has improved slightly. Creosote is quiet; but the price remains about the same.

The average values during the week were: Tar, 17s. 9d. to 21s. 9d., *ex* works. Pitch, London, 35s. 6d. to 36s.; east coast, 35s. to 36s.; west coast, Manchester, 35s. 6d. to 36s. 6d., Liverpool, 35s. 6d. to 36s. 6d., Clyde, 35s. 6d. to 35s. 9d. Benzol, 90 per cent., casks included, London, 9d. to 9⅛d.; North, 8⅞d. to 9d.; 50-90 per cent., casks included, London, 9d. to 9⅛d.; North, 8⅞d. to 9d. Toluol, casks included, London, 9⅛d.; North, 9¼d. to 9⅜d. Crude naphtha, in bulk, London, 4d. to 4¼d.; North, 3⅞d. to 3¾d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10⅞d. to 11d.; heavy naphtha, casks included, London, 1s. to 1s. 1½d.; North, 11d. to 11¼d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 1⅞d. to 2¼d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 9d. to 1s. 9½d.; west coast, 1s. 8d. to 1s. 8½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

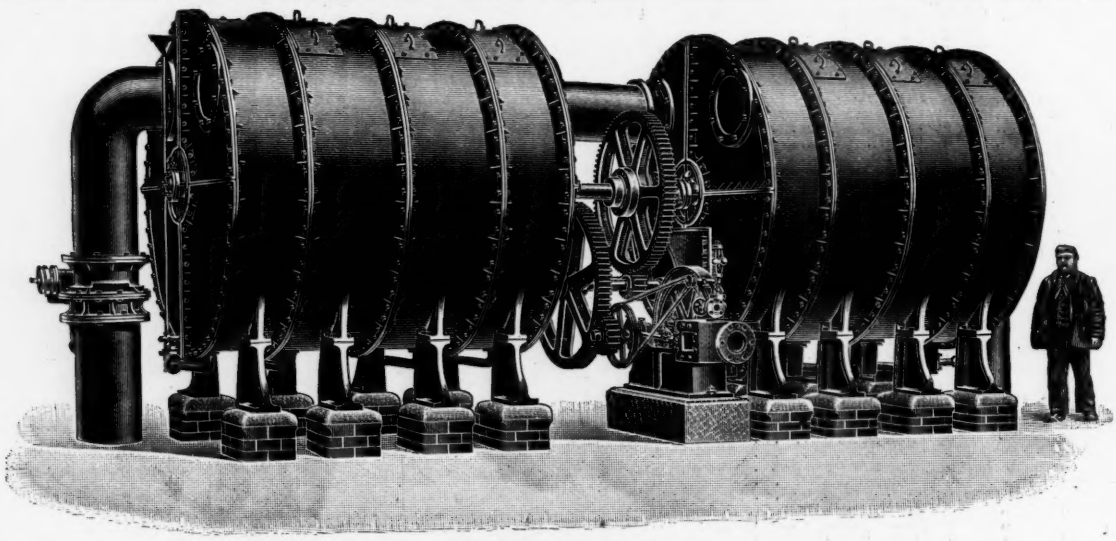
Business has been exceedingly quiet during the past week, and prices at all ports are from 1s. 3d. to 2s. 6d. lower. London makes, 25 per cent., are quoted £13 12s. 6d.; Hull, £14 5s.; Liverpool, £14 5s. to £14 6s. 3d.; Leith, £14 6s. 3d. to £14 7s. 6d.; and Middlesbrough, £14 5s.

Paignton Gas Company.—The annual meeting of this Company was held last Thursday. The Directors reported that the Company continued to show satisfactory progress. The profit for the past half year enabled them to recommend a dividend of 5 per cent.; making with the interim dividend paid in October last 10 per cent. for the year. The reserve account had a credit balance of £1018. The revenue account showed that £7565 was realized by the sale of gas—the consumption being 46,554,000 cubic feet; while the sale of residuals produced £2757. The manufacture of the gas cost £6811. The report was adopted.

ROTARY WASHER SCRUBBER.

Capacity 2,500,000 cubic feet per day,

For Gas-Works, KINGSTON-ON-THAMES. H. W. Packham, Esq., Engineer.



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R. & J. DEMPSTER, Ltd., MANCHESTER.

London Office:

165, GRESHAM HOUSE, OLD BROAD ST., E.C.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a fair demand in the northern coal trade; and with good arrivals of steamers, the shipments have been heavy. In steam coals, best Northumbrians are from 10s. to 10s. 6d. per ton f.o.b., second-class steams are 8s. 9d. to 9s., and steam smalls are rather plentiful at about 4s. 9d. to 6s. 3d. The collieries have been working better of late; and the output has been well taken up for this season. In the gas coal trade, the home demand is rather less; but foreign shipments are enlarging. Durham gas coals vary in price according to quality. The usual classes are from 8s. 6d. to 9s. 3d. per ton f.o.b.; while for "Wear specials," up to 10s. 6d. is quoted. Among the contracts that are reported, that for Rostock Gas-Works, for 12,000 tons, is completed, at a price estimated to leave 10s. 3d. per ton for special coals. Another for 20,000 tons, for shipment to Genoa of second-class gas coals, is believed to be fixed at about 15s. per ton delivered. Contracts for 35,000 tons of gas coals for Russia are in the market. Coke is steady. Good gas coke is in fair demand at about 13s. 7d. to 14s. per ton f.o.b.

Scotch Coal Trade.

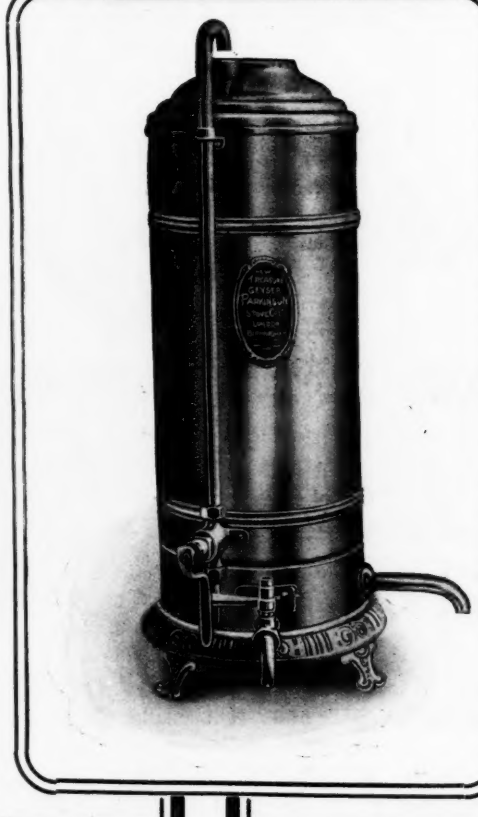
Trade remains unchanged; the shipping required being very slack. For home purposes, the chief demand is still for small sorts. The prices now quoted are: Ell, 8s. 9d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 269,974 tons—a decrease of 28,214 tons upon the previous week, and of 17,379 tons upon the corresponding week last year. For the year to date, the total shipments have been 3,025,208 tons—a decrease of 43,556 tons upon the corresponding period of last year.

Water Supply to Factories.—A meeting of the members of the London Chamber of Commerce was held last Wednesday to consider the question of the supply of water to factories, in view of the judgment of the Court of Appeal in the action by the Metropolitan Water Board against Colley's Patents, Limited, a report of which will be found elsewhere. Mr. Leonard Wells (of Messrs. Wells and Sons, the Solicitors for Messrs. Colley) explained the history of the case, and described the present position. In the course of the speeches made, the case of a large building in the City was cited; and it was declared that, while the value of the water consumed was only about £20, a sum of £300 had to be paid for it. The consensus of opinion was that an appeal to the House of Lords should be proceeded with; and of those present, two announced that they would raise their subscriptions to 100 guineas each, while a third said he would give 50 guineas. Other contributions were intimated; and a Committee was appointed in connection with the matter.

Fletcher, Russell, and Co., Limited.

The nineteenth annual general meeting of this Company was held at Warrington last Wednesday—Mr. George Perkins, the Chairman, presiding. The report presented showed a profit of £3610 for the ten months ended Dec. 31 last. In moving its adoption, the Chairman expressed the regret of the Directors that the position of the Company's affairs did not justify the payment of a dividend to the ordinary shareholders at present. But it would no doubt be agreed that the balance-sheet submitted showed an improvement as compared with last year's, though it was not such as might have been expected. They had had to pay increased prices for nearly all raw materials; and this had, to a great extent, absorbed the economies they had been able to effect during the seven months. However, the Directors hoped to derive a greater benefit from them and from others to be effected; and they intended, if they were re-elected, to continue the work they had commenced, and would endeavour to make the business a more successful one than it had been for some years. Having furnished some financial details, the Chairman said the addition of the amount brought forward raised the £3610 profit to £4110. After deducting the interim dividend paid on the preference shares at the rate of 6 per cent. per annum for the half year ended Aug. 31 (£1500), there was a balance of £2610. The Directors recommended that a final dividend should be declared on the preference shares for the succeeding four months. This would absorb £1000, and leave a balance of £1610 to be carried forward. Mr. F. G. Rowson seconded the motion, and it was carried unanimously. The recommendation in regard to the dividend was agreed to; and the Directors were unanimously re-appointed.

Monte Video Water-Works Company, Limited.—The ordinary general meeting of this Company was held last Thursday—Mr. James Anderson presiding. In moving the adoption of the report, noticed last week (p. 867), the Chairman said the past year had been a prosperous one for the Company; the increase in the net receipts having been greater than in any previous year. The number of houses using the Company's water at the close of 1910 was 21,426—an increase of 2907, or about 15 per cent. The gross receipts were larger by £16,169—an increase of about 12 per cent. This was a very satisfactory showing when they took into consideration the fact that a great number of the new services only came into operation in the last two months of the year. The ratio of working expenses to gross takings again showed a reduction; the figure for last year having been 29·95 per cent., against 31·22 per cent. in 1909 and 34 per cent. in 1908. The Directors proposed this year to inaugurate a contributory provident fund for the benefit of the employees; and they recommended the appropriation of £1500 out of the year's profits for this purpose. Their employees were a loyal and trustworthy body of men; and the Directors thought the object in view a desirable one. The report was unanimously adopted. A resolution was passed increasing the capital by £100,000.



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GEYSER.

No. 92.

A new low-priced "Chamber-Heating" Pattern, delivering water suitable for drinking, at any temperature to boiling.

PRICE

with Gas Tap and Pilot,

£2 16 0

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(as illustrated),

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THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's Patent Geyser Co.),

BIRMINGHAM & LONDON.

Glover and Main, Limited.

The annual general meeting of Messrs. Glover and Main, Limited, was held at the new London show-rooms of the Companies, No. 25, Princes Street, Oxford Circus, last Wednesday—Mr. Richard Thomas Glover in the chair. The Chairman, after dealing with the accounts, referred to the position of the joint Companies, and pointed out that the total turnover in gas-meters and gas-stoves, in spite of very keen competition, showed an increase of over 10 per cent. as compared with the previous year. The new gas-fires, commonly known as the "D. S. O." and "St. Nicholas," had, he said, met with unprecedented success, and were unsurpassed for quality, for design, and for cheapness. Owing to the increased output in stoves, it would be necessary to enlarge the buildings used for the purpose; and this was in addition to the extensions put up last year. Better organization of the works at Edmonton had enabled the trading Companies to work on reduced stocks and to handle large quantities of goods more expeditiously than formerly. He referred to the fully-equipped laboratory and experimental department at the Edmonton works, which was in charge of a duly qualified Research Chemist, and mentioned that the laboratory was not being used merely for advertising purposes, as was the case with some of their competitors, but that it was, and had been for many years, worked on scientific lines, and materially helped in the development of new ideas and in the perfecting of the various "Main" gas cooking and heating appliances. At the last meeting, it was intimated that the Queen Victoria Street show-rooms were wholly inadequate; and the new show-rooms had now been acquired on a lease of 21 years. These show-rooms had already led to an increase in business. Turning to the trading in meters, he stated that the output had been greater last year than ever before. The manufacture of street-lanterns was now in full operation; and the Calcutta Corporation contract for 3000 "Gothic" street-lanterns had been secured in open competition. The Directors had thought it was time that customers abroad were looked up; and his son, Mr. R. B. G. Glover, started last year on a tour round the world in the interests of the trading Companies. His first call was at Calcutta, and he was now visiting Australia and New Zealand. From the reports which had been received from him, there was every likelihood that increased business would result in the near future. As a matter of fact, additional orders had already been cabled home. The Directors had decided that it was advisable, in order to promote the interests of the Companies still further, that he should visit China, Japan, Canada, and the United States. The net result of the improved condition of affairs was that they had been able to pay an interim dividend for the first six months of the year of 2½ per cent. on the preference share capital, and 2 per cent. for the same period on the ordinary share capital, which had absorbed £5250. They now recommended a final dividend for the six months ended Dec. 31 of 2½ per cent. on the preference share capital and 3 per cent. on the ordinary share capital, which would absorb £7250; leaving a balance of £952 to be carried forward to the next account. The interim dividend and the final dividend for the twelve months amounted to 5 per cent. on the preference share capital and 5 per cent. on the ordinary share capital. He moved the adoption of the report and accounts, which was seconded by the Vice-Chairman (Mr. Robert B. Main), and carried unanimously. Mr. R. T. Glover and Sir Paul A. Makins, Bart., were re-elected Directors.

Cookery Lectures at Reading.—Lectures on cookery with the aid of gas-stoves are being given by Miss B. Moss on Thursday afternoons and evenings at the room of the Reading Gas Company; and they are proving very successful. At the afternoon lectures, at which demonstrations of high-class cookery are given, the attendance has been so large that it has not always been possible to accommodate all who desired to attend. In the evening, lectures suitable for persons possessing penny-in-the-slot meters are given. At the first lecture the number present was 59. This had become 69 at the second lecture; and there was a very large number at the third. At a recent lecture, Miss Moss emphasized the point that gas is more economical for cooking than coal, because a gas-oven can be heated in ten minutes, and the supply of heat cut off the moment the cooking is done. In a stove supplied with a slot meter it was possible, she said, to cook a joint, vegetables, and a pie or pudding at a cost of 2d. for gas, if the oven were properly managed. Gas was invaluable for invalid cookery, because special dishes could be prepared at any time. As showing the popularity of gas-stoves in Reading, thanks to the energy displayed by the Gas Company's Engineer and Manager (Mr. Douglas H. Helps) and his staff, the number in use in the district has increased from 13,000 to nearly 16,000 in two years.

Launceston Town Council and the Gas Company's Order.—At a meeting of the Launceston Town Council on Monday last week, the Town Clerk (Mr. C. H. Peter) reported that, by direction of the Council, he had attended before the Board of Trade, when the Council's objections to the granting of the Launceston Gas Company's application for a Provisional Order were considered. He said the Board had agreed with the Council that the capital proposed by the Company appeared to be excessive, and they would reduce it. The Company stated that they would undertake that all new mains should be laid at a depth of 2 feet, which their Engineer said was ample. The Board of Trade official said they could not make any special provision as to existing mains; but he (Mr. Peter) thought it would be satisfactory to the Council and to the town if someone on behalf of the Company would give a public assurance that no question of liability would arise in case of injury to any existing main by an ordinary road-roller, where such injury was caused by reason of the main being laid at an insufficient depth. The inhabitants would see that the Council had taken all reasonable steps for safeguarding the public rights; and if the result was not so satisfactory as might have been wished, this was not the fault of the Council, who had no desire whatever, in the action they had taken, to hamper or injure the Gas Company. Mr. Treleaven, a Director of the Company, said there would be no difficulty on the question of mains. With regard to the insertion of a purchase clause in the Order, they well knew that as a Council they had no idea of purchasing, and that they had had 35 years in which to do it. It was eventually decided that a letter should be written to the Company on the matter.

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For 1911 is the

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(*Made in THREE SIZES.*)

HIGHEST EFFICIENCY.

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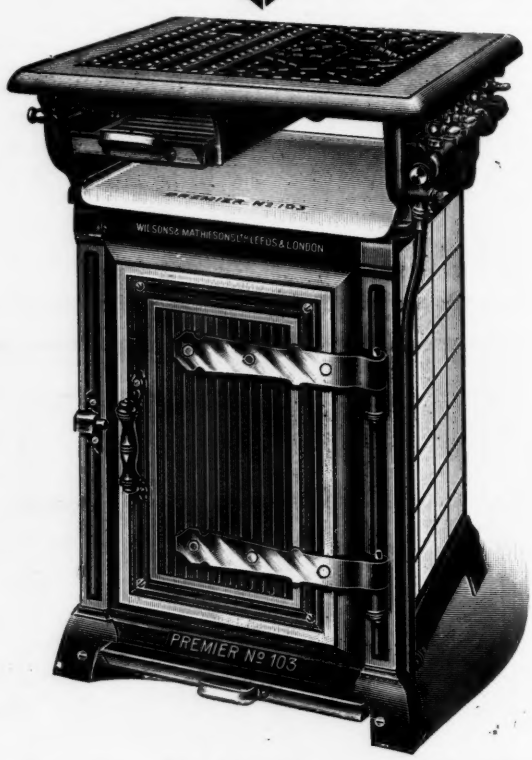

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Independent Tests continue to prove the all-round superiority of the "PREMIER" which has the

Most Efficient GRILL,
Most Efficient OVEN,
Most Efficient TOP BURNERS
("Tangent Star" shape).

Now supplied with **REVERSIBLE HINGED HOT-PLATE** and **UNBREAKABLE CAST-MALLEABLE GRIDS.**

Send for Sample Stove from the MAKERS

WILSONS & MATHIESONS, LTD.,

Carlton Works, ARMLEY, LEEDS.

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The Pulsometer Engineering Company, Limited, at the Allahabad Exhibition received a gold medal for their "Pulsometer" pumps.

The creosoting works of Messrs. Burt, Boulton, and Haywood, at Rouen, were destroyed by fire last Friday night; and the damage is estimated at several thousands of pounds.

It has been decided by the Totnes Town Council to reduce the charge for water for domestic purpose to 10d. in the pound; meter supplies being charged at the rate of 1s. 3d. per 1000 gallons.

At a meeting of the Wath and Bolton Gas Board, it has been unanimously decided to reduce the charge for gas from 3s. 9d. to 3s. 6d. per 1000 cubic feet. One member wished to lower the price by 5d., but it was eventually thought that a present reduction of 3d. would be as far as they could go.

Messrs. John Wright and Co. have now completed a very successful exhibition of gas cooking and heating appliances at the Wesleyan School-Room, Frizington. This neighbourhood has just been supplied with gas from the new works of the Frizington District Council; and the exhibition, which included lectures and practical demonstrations on cooking by Miss Lillie Miles, met with great success.

Messrs. Parker and Lester, of Ormside Street, Old Kent Road, S.E., forward a copy of the new issue of their paint and varnish catalogue. In addition to the numerous well-known specialities which the firm actually manufacture, the list includes particulars of high-class paint and varnish brushes, and various sundries used by painters, plumbers, and others, which they are prepared to supply. The catalogue (which is provided with a loop at one corner for hanging up) may be taken as a seasonable reminder.

The net trading profit of the New Inverted Incandescent Gas-Lamp Company, Limited, for the past year, after allowing for depreciation and all trade charges, is £10,867. The balance shown in the profit and loss account amounts to £9069, which, added to the sum of £1035 brought forward, makes a total available profit of £10,104. Out of this sum, £500 has been written off the patents account; bringing up to £18,500 the total amount so written off. From the balance, the Directors recommend that £1460 be added to the reserve, and that a dividend at the rate of 6¼ per cent., free of income-tax, be paid. This will absorb £6765, and leave £1378 to be carried forward.

The report just issued by the Glasgow engineering and contracting firm of Sir William Arrol and Co., shows that there was a marked recovery last year from the results published a year ago. The report for 1909 showed a net profit of about £60; and the dividend came down from 10 per cent. to nothing. Contracts were more remunerative during 1910, though the Directors complain that prices still remain at a very low level. The net profit for last year was £18,500; and ordinary dividends are resumed with a distribution of 5 per cent.—the carry-forward being increased from £3168 to £5377. A revaluation of the working plant and tools has been made, resulting in an appreciation of £24,611, which has been added to the special reserve fund of £7340, increasing this to a total of £31,951. In view of this favourable result, the Directors do not think it necessary to provide for any depreciation this year; the depreciation fund remaining at £46,662. The business of the Appleby Crane and Transporter Company has been acquired; and for this purpose the remaining 2500 ordinary shares were issued, and the capital increased by £50,000, in the form of 5000 "B" preference 5 per cent. shares.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending March 25. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar crude	per ton	—	18/9 21/9	18/9 22/3	19/- 21/-	19/- 21/-	—
Pitch	,,	37/-	35/6	36/-	36/- 36/6	35/6	35/-
Benzol, 90%	per gallon	-/10	-/9	-/9	-/9	-/9	-/9 -/9½
Benzol, 50-90%	,,	—	-/9¼	-/9½	-/8½	-/8¾	—
Toluol, 90%	,,	-/9½ -/10	-/9½	-/10	-/10	-/10	-/10
Crude naphtha, 30%	,,	—	-/3¾	-/4	-/3½	-/3¾	—
Light oil, 50%	,,	—	-/3½	-/3¾ -/4	-/3⅜ -/3¼	-/3¼ -/3½	—
Solvent naphtha, 90-160	,,	—	-/10⅜ -/11	-/10	-/10	-/11	-/11
Heavy naphtha, 90-190	,,	—	-/11	-/11½	-/10½ -/11	-/11½ -/11¾	-/11
Creosote in bulk	,,	-/2½ -/2⅝	-/2 -/2¼	-/2	-/2 -/2¼	-/2⅛	-/1¾
Heavy oils	,,	—	-/2½ -/3	-/2¼	-/2¾	-/2¾ -/3	-/2¾
Carbolic Acid, 60's	,,	—	1/8 1/9	1/9½	1/8	1/8 1/8½	1/9
Naphthalene, crude drained salts	per ton	—	42/6 45/-	40/- 42/6	46/- 47/6	47/6 48/6	—
,, pressed	,,	—	60/-	63/-	58/9	60/- 72/6	—
,, whizzed	,,	—	—	—	70/- 72/6	60/- 75/-	63/-
Anthracene	per unit	-/2	-/1⅜	-/1½	-/1¼	-/1¼	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

RENTAL AND GENERAL CLERK. Merthyr Tydfil Gas Company. Application by April 5.
TRAVELLER. No. 5361.

Situations, &c., Wanted.

SULPHATE PLANT REPAIRER, &c. Davies, Shepherd's Bush.

Pupils Wanted.

No. 5372.
No. 5373.

Plant, &c. (Second-Hand), For Sale.

HYDRAULIC MAINS, PIPES, MOUTHPIECES, CONDENSERS, WASHER-SCRUBBER, PUMPS, ENGINES, &c. Sutton-in-Ashfield Gas Department. Tenders by April 4.
OIL GAS PLANT. United Turkey Red Company, Glasgow.
PUMPS. W. Johnson, Jun., New Hythe.
RETORTS, SCRUBBERS, METER, GASHOLDER, TAR WELL, AND PUMPS, &c. Great Central Railway. Tenders by April 6.
STATION METER. Oldbury Gas Department.
STEAM-ENGINE AND EXHAUSTER, &c. Aberystwyth Gas Company.

Stocks and Shares.

ANNFIELD PLAIN AND DISTRICT GAS COMPANY. By Tender. April 11.
CAMBRIDGE WATER-WORKS COMPANY. By Tender. April 6.
ENFIELD GAS COMPANY. By Tender. March 31.

TENDERS FOR

Coal and Cannel.

WARRINGTON GAS COMMITTEE. Tenders by April 15.

Engine and Exhauster.

BARNOLDSWICK GAS DEPARTMENT. Tenders by April 3.

Fire-Clay Goods and Retort-Settings.

ABERAVON GAS DEPARTMENT. Tenders by April 10.
WARRINGTON GAS COMMITTEE. Tenders by April 15.

Fires and Cookers.

WARRINGTON GAS COMMITTEE. Tenders by April 15.

General Stores (Taps and Valves, Benzol, Ironmongery, Castings, Flexible Tube, Iron and Steel, Lead and Compo. Pipe, Lime and Cement, Oils and Paints, Purifier Grids, Drysaltery, Vitriol, Bricks, Glass, Shovels, Iron Buckets, &c.).

BURY CORPORATION. Tenders by April 12.
RAMSGATE GAS DEPARTMENT. Tenders by April 10.
WARRINGTON GAS COMMITTEE. Tenders by April 15

Lamps and Gas-Fittings.

WARRINGTON GAS COMMITTEE. Tenders by April 15.

Meters.

WARRINGTON GAS COMMITTEE. Tenders by April 15.

Oxide of Iron.

BROADSTAIRS GAS COMPANY. Tenders by April 4.

Pipes, &c.

RAWCLIFFE GAS COMPANY. Tenders by April 5.
WARRINGTON GAS COMMITTEE. Tenders by April 15.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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